TECHNOLOGY IMPLEMENTATION PLAN

PART 2 – Project Results

A Framework for the further development and exploitation of the results of EC RTD Projects

DOCUMENT TITLE: Technology Implementation Plan PART 2 – Project Results		
DATE: 01/04/00	**VERSION FP4 2.2**	**ORIGINATOR:** European Commission

Part 2a: Description of result* 1 Project Number: ENV4-CT97-0399

Please give information on each of the results chosen for a specific exploitation route. Refer to the guidelines for further details.

Table 6. Summary of exploitable result

Mandator

This information is for administration purposes only and will not be published.

Summarise exploitable result, identify the partners (result owners) involved and describe the exploitation intentions

Title of Result	Algorithm for the retrieval of cloud top height and cloud cover from satellite measurements
Partners involved	UCL
Exploitation intention	Use within operational nowcasting, numerical weather prediction models, climatological studies
Category	☐ Exploitable result used only within consortiums ☐ non exploitable result ☒ exploitable result of interest for third parties

(you can use free text in each table cell, but be as short and to the point as possible. In the **Category** cell tick the appropriate box, one box only)

7. Summary (200-300 words maximum)

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Provide an overview of the result which gives the reader an immediate impression of the nature of the result and its relevance and potential!

Starting from georeferenced stereo satellite or aircraft imaging data, the algorithm automatically computes cloud-top heights and if a suitable ground reference Digital Elevation Model computes cloud cover defined as clouds above a user-defined threshold. The computation includes a stereo matching algorithm as well as a space intersection ("camera model") to transform matched disparities into altitudes above a reference datum.

*** - insert the number of the specific exploitable result**

8. Description of result

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

A full technical description in the form of an Algorithm Theoretical Basis Document (ATBD) together with software implementation in the IDL programming language for ATSR2 and AirMISR. Also available is a C-language version of the stereo matching routine.

Categorise subject description using codes from Annex 4.

Subject descriptor codes	C01	C06		

9. Current stage of development

CONFIDENTIAL
No
Select Yes/No from dropdown menu

STAGE OF DEVELOPMENT	Select one category only (tick the box)
Basic research	☐
Applied research	☐
Experimental development stage (Laboratory prototype)	☐
Prototype/demonstrator available for testing	☐
Results of demonstration trials available	☐
Other: (Please specify!)	☒

Briefly describe the current status/applications of the result!

The software has been coded and over 80 examples have been demonstrated from ATSR2 and 3 from AirMISR

10. Documentation and information on exploitable result

Add here a list of the **most important and relevant** information and documentation, indicating the confidentiality status of each document. The "document status" box indicates whether the document being referred to is confidential (and might be made available to third parties only after the signing of a confidential disclosure agreement). The "confidentail" box indicates, whether the knowledge that a document exists is in itself confidential.
Add promotional material that can be used for illustrating the result in dissemination services such as photographs, items of artwork, video clip, interviews, piece of animation, etc.

Documentation type	Document Status **PU**=Public **CO**=Confidential	Details (Title, ref. number, general description, language)	CONFIDENTIAL Select Yes/No from dropdown menu
Scientific publication	PU	Muller, J.-P., R. Dundas, K.L.M. Mitchell, H.M. Mannstein, and M.A. Denis, Stereo cloud-top height and amount retrieval from ATSR2., Rem. Sens. Env., In Preparation, 2001.	No
Scientific publication	PU	Muller, J.-P., R. Dundas, and D. Bower, An automated processing system for cloud-top height and amount from ATSR(2) stereo., in International workshop on Applications of the ERS Along Track Scanning Radiometer., ESA, 23 - 25 June 1999, ESRIN, Frascati, Italy, 1999a	No
			No
			No
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			No
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			No
			No
			No

Part 2b: Exploitation of result

11. Exploitation strategy for the specific result

Mandator

11.1 Using the table below, indicate the intellectual and industrial property rights being exploited (all foreground and possible background rights)

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Type of IPR		Details (what is covered, reference numbers, countries covered) for all IPRs indicated in the Foreground (FG) and/or Background (BG) fields.	Number Fore-ground IPR's	Number Back-ground IPR's
Patent applied for	**FG**			
	BG			
Patent search carried out	**FG**			
	BG			
Patent obtained	**FG**			
	BG			
Registered design	**FG**			
	BG			
Trademark Applications	**FG**			
	BG			
Copyrights	**FG**			
	BG			
Secret know-how	**FG**			
	BG			
Other – Please specify	**FG**	Algorithm is published in the open literature		
	BG			

Please enter in the "Details" field the information for **all** the IPR's. If you have more than one IPR per type (e.g. more than one patent), indicate in the "Nr of Foreground IPR's" and/or in the "Nr of Background IPR's fields" the respective numbers.

11.2 Define the role of each partner and the co-operation between the partners involved in the exploitation

CONFIDENTIAL
No
Select Yes/No from dropdown menu

UCL: Development of algorithm, application to satellite data.

11.3 Collaboration sought

CONFIDENTIAL
No
Select Yes/No from dropdown menu

If you are looking for support by third parties, please indicate by using the keys or boxes below

KEY "Collaboration Sought"

R&D	☒	: Further research or development	JV	☐	: Joint venture
LIC	☒	: Licence agreement	MKT	☐	: Marketing agreement
MAN	☐	: Manufacturing agreement	FIN	☐	: Financial support
C	☐	: Venture Capital/spin-off funding	PPP	☐	: Private-public partnership
INFO	☐	: Information exchange	Other	☐	: (Please specify below)

Other:			

Describe the exploitation opportunity that you can offer your potential partner.

Provision of algorithm for setting up an operational system for the value-added satellite data industry for provision of cloud-top height information for aviation meteorology and weather forecasting

12. Exploitation activities and timetable

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Describe the exploitation activities, the milestones involved and give a timetable (what will be done by whom and when?)

The task of KNMI within the CLOUDMAP consortium is to evaluate the potential end-use of CLOUDMAP products and techniques by the European meteorological and climate research community. For this purpose KNMI performed a "roadshow" to relevant user-institutes in Europe. The roadshow consisted of five meetings, held in five different countries:

- Deutsche Wetterdienst (DWD) at Offenbach, Germany on September 19, 2000.
- Laboratoire de Météorologie Dynamique (LMD) in Paris, France on October 6, 2000.
- The Met Office in Bracknell, UK on October 13, 2000.
- Swedish Meteorological and Hydrological Institute (SMHI) in Norrköping, Sweden on October 19, 2000.
- Royal Netherlands Meteorological Institute (KNMI) in De Bilt, The Netherlands on November 22, 2000.

During these meetings the CLOUDMAP evaluators from KNMI have met potential end-users and experts on cloud information from satellites with the purpose to obtain feedback on the CLOUDMAP project and products itself and its applicability in real practice. Over a hundred people took part in the five different meetings.

Further evaluation is currently being performed by KNMI, SMHI and SMI as part of the 5th Framework CLOUDMAP2 project.

Timetable:

Activity	Partner(s) involved	starting from ... to ...
R&D of CTH product in CLOUDMAP1	UCL	1/1/1998 to 1/1/2001
End use evaluation in CLOUDMAP1	KNMI	1/9/2000 to 1/12/2000
Refinement of CTH product in CLOUDMAP2	UCL	1/2/2001 to 1/2/2004
End use evaluation in CLOUDMAP2	KNMI	1/1/2003 to 1/1/2004
		to
		to
		to
		to
		to
		to

13. Exploitation potential*

CONFIDENTIAL
No
Select Yes/No from dropdown menu

When describing the exploitation potential, you might want to consider one or all of the following factors:

- What are the potential applications for this result?
- Who are the users of this result?
- What are the main innovative features and benefits (technical/commercial success factors)?
- Analysis of the market sector
- Potential barriers

**** for PROSOMA users and those providing commercially relevant results, please concentrate on describing the business opportunity of your result***

The "road-show" along end-users resulted in the following conclusions on the applicability and potential users of the product:
In the near future there will be a need for cloud-top-height (CTH) data, independently observed from satellites, for application in Numerical Weather Prediction (NWP). The availability of a solid error structure of the CTH product is a necessity for successful application in NWP.
The climate research community has a large interest in independently observed CTH data. However, the community sets high demands to a solid validation of the product before application in climate research will be accepted. At this stage of the CLOUDMAP project the validation of CTH products does not yet match this requirement.
The CLOUDMAP CTH product forms a potential independent data source for height assignment of cloud motion vectors (as used in NWP models).
CTH is not a key parameter in operational forecasting (cloud base height and the temporal development of clouds, e.g. CB's, has higher priority).

The main innovative feature and benefit of the CTH product (as derived from the stereo matching technique) is that it is a independently derived product. Besides the satellite data, no additional information is needed. Moreover, the ability of the stereo matching technique to map correctly the CTH of Cirrus clouds forms a strong recommendation to use this technique operationally since other data sources (both ground and space based) do not provide this information.

The scientific community in meteorology and climate research (national meteorological institutes and universities) will be the primary user of this product.

For a successful application of this CTH product in operational meteorological environments (forecasting, NWP) real-time accessibility and high data frequency (e.g. every hour) is needed. The current available sensors for stereo matching can not yet meet this requirement.

Categorise market application sector using codes from Annex 5.

14. Ability of partners to carry out the exploitation

CONFIDENTIAL
No
Select Yes/No from dropdown menu

When describing this part, you might want to consider one or all of the following factors:

- Estimate the investment and describe the skills which will be required for exploitation of the result
- How do you intend to finance these investments?
- What is the expected return on investment?
- What risks are involved?

If you seek additional partners, clearly describe your input and the expected input from the external partner(s)!

The partners do not have plans (besides the activities as planned in the CLOUDMAP2 project) to actively exploit the described product other than in scientific publications.

15. Contact person for this exploitable result

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Name	Professoir Jan-Peter Muller
Position	Professoir
Organisation	UCL
Address	Department of Geomatic Engineering, Gower Street, London WC1E 6BT
Telephone	+44 20 7679 7227
Fax	+44 20 7380 0453
E-mail	jpmuller@ge.ucl.ac.uk

16. Organization information

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Provide a short description of your organization and if necessary, provide contact details on persons who are more involved in the exploitation aspects and/or the technical aspects.

The Geometic Department of University College London is one of the premier geomatics departments in Europe with 8 full-time academic staff and some 100 research staff and post-graduate students. All exploitationof UCL IPR is performed through UCLv led by Dr Jeff Skinner (j.skinner@ucl.ac.uk)

The Royal Netherlands Meteorological Institute (KNMI) is a government-agency of the Ministry of Transport and Public Works. KNMI is the national meteorological centre for weather forecasts and climate research. KNMI provides vital weather and sea state information to ensure safety in sea and air traffic. Employing about 500 highly qualified staff, up-to-date technicians and international recognized scientists are supportive to the achievement of the mission. The scope of work does not only cover meteorology. KNMI has also great experience in atmospheric chemistry, geophysics, oceanography and satellite remote sensing.

17. Authorisation

Mandator

I confirm that the information contained in the Technology Implementation Plan which is marked **CONFIDENTIAL / NO** may be disseminated by the Commission :

Name: Prof. J-P Muller

Date: 01.02.01

Organisation: Geometic Department, University College London

TECHNOLOGY IMPLEMENTATION PLAN

PART 2 – Project Results

A Framework for the further development and exploitation of the results of EC RTD Projects

DOCUMENT TITLE: Technology Implementation Plan PART 2 – Project Results		
DATE: 01/04/00	**VERSION FP4 2.2**	**ORIGINATOR:** European Commission

Part 2a: Description of result* 2 Project Number: ENV4-CT97-0399

Please give information on each of the results chosen for a specific exploitation route. Refer to the guidelines for further details.

Table 6. Summary of exploitable result

Mandator

This information is for administration purposes only and will not be published.

Summarise exploitable result, identify the partners (result owners) involved and describe the exploitation intentions

Title of Result	Contrail climatology
Partners involved	DLR
Exploitation intention	climate change research
Category	☐ Exploitable result used only within consortiums ☐ non exploitable result ☒ exploitable result of interest for third parties

(you can use free text in each table cell, but be as short and to the point as possible. In the **Category** cell tick the appropriate box, one box only)

7. Summary (200-300 words maximum)

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Provide an overview of the result which gives the reader an immediate impression of the nature of the result and its relevance and potential!

Starting from an algorithm, which analyses single satallite datasets (from NOAA 14 AVHRR HRPT or LAC data) in order to detect contrails, a methode to derive statistically meaningful datasets of contrail coverage was devellopped. Both, the methode and the resulting dataset on contrail coverage have their scientific value, as the mean cloud coverage by contrails is still unknown for large parts of the world.

*** - insert the number of the specific exploitable result**

8. Description of result

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

The contrail detection algorithm indicates contrails within AVHRR14 HRPT and LAC data with a very low false alarm rate (less then 0.1%). A statistical postprocessing methode allows to derive regional contrail coverage after application of the algorithm to a sufficiently largwe data volume.

Categorise subject description using codes from Annex 4.

Subject descriptor codes	C1	C6		

9. Current stage of development

CONFIDENTIAL
No
Select Yes/No from dropdown menu

STAGE OF DEVELOPMENT	Select one category only (tick the box)
Basic research	☐
Applied research	☒
Experimental development stage (Laboratory prototype)	☐
Prototype/demonstrator available for testing	☐
Results of demonstration trials available	☒
Other: (Please specify!)	☐

Briefly describe the current status/applications of the result!

The algorithm and first results for Europe are already published, the publication of results for S-E Asia is in preparation, data covering E-Asia are already processed.

10. Documentation and information on exploitable result

Add here a list of the **most important and relevant** information and documentation, indicating the confidentiality status of each document. The "document status" box indicates whether the document being referred to is confidential (and might be made available to third parties only after the signing of a confidential disclosure agreement). The "confidentail" box indicates, whether the knowledge that a document exists is in itself confidential**.**
Add promotional material that can be used for illustrating the result in dissemination services such as photographs, items of artwork, video clip, interviews, piece of animation, etc.

Documentation type	Document Status **PU**=Public **CO**=Confidential	Details (Title, ref. number, general description, language)	CONFIDENTIAL Select Yes/No from dropdown menu
scientific publication	PU	Mannstein, H., R. Meyer, and P. Wendling: Operational detection of contrails from NOAA-AVHRR-data. Int. J. Remote Sensing, 20(8):1641-1660, 1999	No
Thesis	PU	Meyer, R.: Regionale Kondensstreifen-Bedeckung aus Satellitendaten und ihr Einfluss auf den Strahlungshaushalt. PhD-Thesis, Ludwig-Maximilians-Universität München, Fakultät für Physik	No
scientific publication	PU	Meyer, R.,H. Mannstein, R. Meerkoetter, U. Schumann, and P. Wendling: Regional radiative forcing by line-shaped contrails derived from satellite data. (submitted January 15th, 2001 to J. Geophys. Res.), 2001	No
			No
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			No
			No
			No
			No
			No
			No
			No
			No

Part 2b: Exploitation of result

11. Exploitation strategy for the specific result

Mandator

11.1 Using the table below, indicate the intellectual and industrial property rights being exploited (all foreground and possible background rights)

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Type of IPR		Details (what is covered, reference numbers, countries covered) for all IPRs indicated in the Foreground (FG) and/or Background (BG) fields.	Number Fore-ground IPR's	Number Back-ground IPR's
Patent applied for	**FG**			
	BG			
Patent search carried out	**FG**			
	BG			
Patent obtained	**FG**			
	BG			
Registered design	**FG**			
	BG			
Trademark Applications	**FG**			
	BG			
Copyrights	**FG**			
	BG			
Secret know-how	**FG**			
	BG			
Other – Please specify	**FG**	algorithm is published in the open literature		
	BG			

Please enter in the "Details" field the information for **all** the IPR's. If you have more than one IPR per type (e.g. more than one patent), indicate in the "Nr of Foreground IPR's" and/or in the "Nr of Background IPR's fields" the respective numbers.

11.2 Define the role of each partner and the co-operation between the partners involved in the exploitation

CONFIDENTIAL
No
Select Yes/No from dropdown menu

11.3 Collaboration sought

CONFIDENTIAL
No
Select Yes/No from dropdown menu

If you are looking for support by third parties, please indicate by using the keys or boxes below

KEY "Collaboration Sought"

R&D	☒	: Further research or development	JV	☐	: Joint venture
LIC	☐	: Licence agreement	MKT	☐	: Marketing agreement
MAN	☐	: Manufacturing agreement	FIN	☒	: Financial support
C	☐	: Venture Capital/spin-off funding	PPP	☐	: Private-public partnership
INFO	☒	: Information exchange	Other	☒	: (Please specify below)

Other:	other groups, that use the algorithm		

Describe the exploitation opportunity that you can offer your potential partner.

AVHRR HRPT data can only be received locally. Many organisations around the world retrieve and archive these data. If they are interested in an overview of contrail coverage in their region, they can use the algorithm and the statistical postprocessingt methode. Our support in implementation of the algorithm and training of personel should be financed.

12. Exploitation activities and timetable

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Describe the exploitation activities, the milestones involved and give a timetable (what will be done by whom and when?)

The algorithm has been given to NASA/Langley, to the British Met Office and to NILU (Norwegian Institute for Air Research- EU financed TRADEOFF project)

Timetable:

Activity	Partner(s) involved	starting from ... to ...
		to
		to
		to
		to
		to
		to
		to
		to
		to
		to

13. Exploitation potential*

CONFIDENTIAL
No
Select Yes/No from dropdown menu

When describing the exploitation potential, you might want to consider one or all of the following factors:

- What are the potential applications for this result?
- Who are the users of this result?
- What are the main innovative features and benefits (technical/commercial success factors)?
- Analysis of the market sector
- Potential barriers

**** for PROSOMA users and those providing commercially relevant results, please concentrate on describing the business opportunity of your result***

The global application of the contrail detection methode would result in a global climatology of contrail coverage resulting in a much better knowledge on the influence of air traffic on climate.

Categorise market application sector using codes from Annex 5.

14. Ability of partners to carry out the exploitation

CONFIDENTIAL
No
Select Yes/No from dropdown menu

When describing this part, you might want to consider one or all of the following factors:

- Estimate the investment and describe the skills which will be required for exploitation of the result
- How do you intend to finance these investments?
- What is the expected return on investment?
- What risks are involved?

If you seek additional partners, clearly describe your input and the expected input from the external partner(s)!

The potential partner should have access to an archive of NOAA14 HRPT or LAC data. Such archives are usually in close connection to satellite receiving stations. There are only moderate requirements on hard- and software to process the data: apr. 400 Mbyte memory, apr. 10 Gbyte disk, IDL . The effort of 3-6 PM depending on the skill should enable a potential partner to produce a regional contrail climatology within a total time of 1-2 years, depending on processing speed and organisation of the archive.

15. Contact person for this exploitable result

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Name	Dr. Hermann Mannstein
Position	staff scientist
Organisation	DLR-IPA
Address	
Telephone	++49 8153 28 2503
Fax	++49 8153 28 1841
E-mail	Hermann.Mannstein@dlr.de

16. Organization information

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Provide a short description of your organization and if necessary, provide contact details on persons who are more involved in the exploitation aspects and/or the technical aspects.

17. Authorisation

Mandator

I confirm that the information contained in the Technology Implementation Plan which is marked **CONFIDENTIAL / NO** may be disseminated by the Commission :

Name: Hermann Mannstein Date: Jan 31 2001

Organisation: DLR-IPA

TECHNOLOGY IMPLEMENTATION PLAN

PART 2 – Project Results

A Framework for the further development and exploitation of the results of EC RTD Projects

DOCUMENT TITLE: Technology Implementation Plan PART 2 – Project Results		
DATE: 01/04/00	**VERSION FP4 2.2**	**ORIGINATOR:** European Commission

Part 2a: Description of result* 3 Project Number: ENV4-CT97-0399

Please give information on each of the results chosen for a specific exploitation route. Refer to the guidelines for further details.

Table 6. Summary of exploitable result

Mandator

This information is for administration purposes only and will not be published.

Summarise exploitable result, identify the partners (result owners) involved and describe the exploitation intentions

Title of Result	Cloud shadow height and shadow drift data
Partners involved	DLR IPA for testing the results
Exploitation intention	Provision of high resolution cloud and cloud shadow data for validation purposes
Category	☒ Exploitable result used only within consortiums ☐ non exploitable result ☐ exploitable result of interest for third parties

(you can use free text in each table cell, but be as short and to the point as possible. In the **Category** cell tick the appropriate box, one box only)

7. Summary (200-300 words maximum)

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Provide an overview of the result which gives the reader an immediate impression of the nature of the result and its relevance and potential!

High resolution MOMS cloud images of clouds and cloud shadows, obtained with a time gap < + 10 minutes at the crossing points with CLOUDMAP satellites (ERS-2, IRS-P3, NOAA-14), were selected, evaluated and provided to the project. A "cloud shadow analysis" was applied to the MOMS data as a new method to derive "true shadow height" and "true shadow drift" of clouds at high resolution. The results were provided to the project as "ground truth data" to study cloud effects at the sub-pixel scale of satellite cloud images (MOS, ATSR, AVHRR) and to evaluate the role of the “stereo ambiguity” between height and along track drift of clouds on the evaluation of ATSR and MISR cloud stereo scenes.

*** - insert the number of the specific exploitable result**

8. Description of result

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Up to now more than seven MOMS cross-point scenes were evaluated, comprising two triple coincidences of MOMS with MOS and ATSR and one two layer cloud scene over the validation site Chilbolton. Machined cloud to cloud shadow matching was accomplished by introducing radiometrical inverted cloud shadow regions. The contribution of (wrong) matches of land surface features to the matching between clouds and their shadow or between the shadows could be reduced by a special matching algorithm allowing for a confinement of the range of parallaxes for every individual matching task. An IDL-version of this matcher was developed at the DLR-Institute for Planetary Research at Berlin and provided for the project.
However, for complicated multi-layer cloud scenes, with many (partly) hidden parts of clouds or shadows, MOMS data analysis could be performed effectively only with a high degree of manual control or even only as a purely manual and very time-consuming process!
Stereoscopic and shadow height values assigned to clouds in MOMS images refer to an intermediate level between cloud base height CBH (cloud condensation level) and cloud top height CTH, since matching is based on the intensity variations at the rim of clouds and especially cloud shadows and because the central parts of MOMS clouds suffer from signal saturation!
The accuracy of the matching process is estimated from statistical analysis of the variation of the results within small clouds or within neighbouring regions of large clouds, that is within "short range". This "short range noise" accumulates at values of 1.5 to 3 pixel or 27 to 54 m for stereoscopic and shadow height, a result much better than the 150 to 300 m value desired for CLOUDMAP. For the shadow drift analysis the "short range noise" accumulates at values of 2 to 5 pixel or 36 to 90 m within the +/- 20 second stereo time interval, leading to a noise level of 1 to 4.5 m/s for the cloud drift vectors and to be compared with a desirable level 0f 2 m/s. The less favourable results refer to highly mountainous regions. It is assumed, that the observed matching noise is effectively diminished by summing up results of larger regions and that expectations can this wise also be met for the shadow drift analysis.
Systematic contributions from image distortion to cloud height estimation for cases without shadows or ground control had to be estimated and removed by a linearised model of MOMS image generation. The residual error of this process is estimated to about 0.5 to 1 km, according to imperfect knowledge of absolute orbital height and especially absolute attitude, of the MOMS camera. No systematic analysis of this residual error was performed up to now, neither for the derivation of digital terrain models, nor for CLOUDMAP.

Categorise subject description using codes from Annex 4.

Subject descriptor codes	C01	C06		

9. Current stage of development

CONFIDENTIAL
No
Select Yes/No from dropdown menu

STAGE OF DEVELOPMENT	Select one category only (tick the box)
Basic research	☒
Applied research	☒
Experimental development stage (Laboratory prototype)	☒
Prototype/demonstrator available for testing	☐
Results of demonstration trials available	☐

Briefly describe the current status/applications of the result!

Cloud shadow analysis based on high resolution MOMS stereo images could demonstrate its potential with regard to the achievable performance. The applied procedures are still experimental, requiring a large degree of human interaction. However, the basic principles can easily be applied with high resolution images of other space-borne sensors and also be transferred to other projects needing high resolution “ground truth” data for a systematic comparison with, or evaluation of meteorological satellite data.
All MOMS scenes were analysed for cloud and especially contrail content. Additionally the results of a study of the observation conditions at the cross points with the satellites ERS-2, IRS-P3, NOAA-14 i available. Up to now more than seven MOMS cross-point scenes were evaluated, comprising two triple coincidences of MOMS with MOS and ATSR and one two layer cloud scene over the validation site Chilbolton.
MOMS cloud images suffer from a high degree of signal saturation since MOMS cloud images were not taken on purpose (CLOUDMAP did not foresee any funding of this data). An electronic instability of the MOMS signal amplifier requires a difficult "de-striping process" by experienced personal of DLR. This did take place only at low priority for the highly cloud covered scenes required for CLOUDMAP. For that reason the provision of evaluation results of cross-point scenes did take place only late in the project, so that these data could not more applied for a systematic comparison with the synchronous satellite data within CLOUDMAP 1.

10. Documentation and information on exploitable result

Add here a list of the **most important and relevant** information and documentation, indicating the confidentiality status of each document. The "document status" box indicates whether the document being referred to is confidential (and might be made available to third parties only after the signing of a confidential disclosure agreement). The "confidentail" box indicates, whether the knowledge that a document exists is in itself confidential.
Add promotional material that can be used for illustrating the result in dissemination services such as photographs, items of artwork, video clip, interviews, piece of animation, etc.

Documentation type	Document Status **PU**=Public **CO**=Confidential	Details (Title, ref. number, general description, language)	CONFIDENTIAL Select Yes/No from dropdown menu
conference proceedings	PU	Drescher A, 2000 Stereo Monitoring of Cloud Fields: A New Task for Space-Borne Remote Sensing, 19. Jahrestagung der DGPF, Essen, 13-15 October 1999, Publikationen der DGPF, Band 8, Berlin 2000, pp. 399-403.	No
conference proceedings	PU	Drescher, A., H. Hetzheim and J. Fischer: "New concepts for space-borne monitoring of drift and 3D-morphology of cloud fields for weather forecast and climate research, Proc. Internat. Symposium on earth observation systems for sustainable development, Bangalore, India,1998, pp.178-182.	No
conference proceedings	PU	Drescher A., R. Sandau, 200 Tandem Satellite Concepts for Earth Remote Sensing, 51. IAF Congress, Session 11.4 Small Satellites for Earth Observation: Lessons Learnt and Future Projects, October 2000, Rio de Janeiro, Brazil	No
			No
			No
			No

Part 2b: Exploitation of result

11. Exploitation strategy for the specific result

Mandator

11.1 Using the table below, indicate the intellectual and industrial property rights being exploited (all foreground and possible background rights)

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Type of IPR		Details (what is covered, reference numbers, countries covered) for all IPRs indicated in the Foreground (FG) and/or Background (BG) fields.	Number Fore-ground IPR's	Number Back-ground IPR's
Patent applied for	**FG**			
	BG			
Patent search carried out	**FG**			
	BG			
Patent obtained	**FG**			
	BG			
Registered design	**FG**			
	BG			
Trademark Applications	**FG**			
	BG			
Copyrights	**FG**			
	BG			
Secret know-how	**FG**			
	BG			
Other – Please specify	**FG**			
	BG			

Please enter in the "Details" field the information for **all** the IPR's. If you have more than one IPR per type (e.g. more than one patent), indicate in the "Nr of Foreground IPR's" and/or in the "Nr of Background IPR's fields" the respective numbers.

11.2 Define the role of each partner and the co-operation between the partners involved in the exploitation

CONFIDENTIAL
No
Select Yes/No from dropdown menu

The basic principals for matching of clouds and cloud shadows as also for the data analysis in the CLOUDMAP project are developed without DLR-external partners based on resources available within DLR. The details of procedure selection and parameter settings are influenced by the discussions with the other CLOUDMAP partners. The discussions within CLOUDMAP have clarified the basic understanding of the task and helped to identify and solve specific problems associated with the shadow analysis.

11.3 Collaboration sought

CONFIDENTIAL
No
Select Yes/No from dropdown menu

If you are looking for support by third parties, please indicate by using the keys or boxes below

KEY "Collaboration Sought"

R&D	☒	: Further research or development	JV	☐	: Joint venture
LIC	☐	: Licence agreement	MKT	☐	: Marketing agreement
MAN	☐	: Manufacturing agreement	FIN	☐	: Financial support
C	☐	: Venture Capital/spin-off funding	PPP	☐	: Private-public partnership
INFO	☒	: Information exchange	Other	☐	: (Please specify below)

Other:			

Describe the exploitation opportunity that you can offer your potential partner.

The following future exploitation opportunities are derived from experience gained with multiple view MOMS cloud scene evaluation in CLOUDMAP 1:
MOMS cloud scenes at cross points with meteorological satellites can be offered as high resolution reference data sets for validation tasks.
The principles of MOMS cloud and cloud shadow data evaluation can be transferred to other projects including planetary research.
Requirements for a new generation of image processing systems can be defined from the experience gained with the processing of multiple view MOMS cloud scenes.
Completion of existing polar orbiting meteorological satellites with small satellites bearing a new generation CLOUDMAP-type instruments operating at a larger swath width than the present ones in a TANDEM configuration is proposed to bring CLOUDMAP-principles to broader future application in weather forecast and climate research.

12. Exploitation activities and timetable

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Describe the exploitation activities, the milestones involved and give a timetable (what will be done by whom and when?)

The procedures applied for and the results of MOMS cloud scene evaluation within CLOUDMAP 1 were presented in the project meetings and further on as oral presentation and papers in the proceedings of one national and one international conference.

The time table below defines only the corresponding activities within CLOUDMAP 1. No partners or time table can be specified presently for the future exploitation opportunities indicated in the previous chapter 11.3.

Timetable:

Activity	Partner(s) involved	starting from ... to ...
Contrail and cloud screening of all MOMS images	DLR IOE (image provision)	Jan. 98 to Jun. 99
MIR orbit interpolation model	DLR GSOC (advice)	Jun. 98 to Sep.98
Satellite cross point analysis for MOMS	DLR GSOC (advice)	Oct 98 to Mar. 00
MOMS image selection for CLOUDMAP	DLR IPA (advice)	Apr. 00 to Jun. 00
Experimental cloud to shadow matching	DLR IPE (personal)	Jan. 98 to Jun. 99
Development of IDL matcher	DLR IPE (personal)	Jan. 99 to Oct 99
MOMS image distortion model	DLR GSOC (advice)	Apr. 00 to Jun. 00
MOMS level 0 data processing	DLR IOE (personal)	Jan. 00 to Sep.00
Matching of selected MOMS images	DLR IMF (advice)	Jun. 00 to Sep.00
Analysis of results	DLR IPA (advice)	Oct 00 to Dec. 00

13. Exploitation potential*

CONFIDENTIAL
No
Select Yes/No from dropdown menu

When describing the exploitation potential, you might want to consider one or all of the following factors:

- What are the potential applications for this result?
- Who are the users of this result?
- What are the main innovative features and benefits (technical/commercial success factors)?
- Analysis of the market sector
- Potential barriers

**** for PROSOMA users and those providing commercially relevant results, please concentrate on describing the business opportunity of your result***

MOMS cloud scenes at cross points with meteorological satellites can be offered as high resolution reference data sets for validating cloud data of those satellites. The principles of MOMS cloud shadow height and shadow drift estimation may be applied asn an additional and independent tool for the validation task.

A common definition of requirements for a new generation of image processing systems derivable from experience with multiple view cloud image processing may be of interest for developers of image processing systems.

The TANDEM satellite concept proposed at the IAF congress 2000 in Rio is offering the potential for a low cost and low risk provision of CLOUDMAP-type meteorological data at a (much) higher global repetition rate than presently. This might be essential to bring the proven CLOUDMAP principles to a world wide application by the agencies responsible for weather forecast and/or climate research.

Categorise market application sector using codes from Annex 5.

14. Ability of partners to carry out the exploitation

CONFIDENTIAL

No

Select Yes/No from dropdown menu

When describing this part, you might want to consider one or all of the following factors:

- Estimate the investment and describe the skills which will be required for exploitation of the result
- How do you intend to finance these investments?
- What is the expected return on investment?
- What risks are involved?

If you seek additional partners, clearly describe your input and the expected input from the external partner(s)!

Potential partners should be able to independently (and also commonly) estimate the application potential, possible cost and inherent risk of the offered opportunity.

15. Contact person for this exploitable result

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Name	Drescher
Position	Scientific co-worker
Organisation	DLR Centre Oberpfaffenhofen, Institute of Remote Sensing Technology
Address	D-82234 Wessling, Germany
Telephone	+(0)8153-28-2793
Fax	+(0)8153-28-1444
E-mail	armin.drescher@dlr.de

16. Organization information

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Provide a short description of your organization and if necessary, provide contact details on persons who are more involved in the exploitation aspects and/or the technical aspects.

DLR sees itself as a modern research enterprise.
In its strategic orientation, DLR focuses on integrating the potential of national and international endeavours involving partners from research institutions and industry. More information on web: http://www.dlr.de/forschung/inhr.htm;internal&LANGUAGE=en
The Institute for Remote Sensing Technology (IMF) at Oberpfaffenhofen and Berlin is, together with the German Remote Sensing Data Centre (DFD), part of the cluster „Applied Remote Sensing“.
The IMF is engaged in research and development of remote sensing technology. Centre of activity are procedures and associated processing systems for information extraction from remote sensing data with the aim of integrating these into the operational chains of the DFD.
On this base the IMF is participating in the design of new sensor systems and technology transfer.
Main activities of the IMF are:
Sensor concepts, evaluation procedures and data processing systems of spectrometers for atmospheric research,
Signal processing algorithms for synthetic aperture radar (SAR)-data with emphasis for interferometry,
Photogrammetry and image processing,
Automatic image interpretation, content based search procedures and „information mining“ in large and heterogeneous remote sensing data complexes,
Derivation of biological and ecological characteristics of coastal and inland waters with imaging spectrometers („ocean colour“),
Extraction of hydro-physical ocean parameters from SAR-data and assimilation into sea motion models,
Operation and scientific attendance of the airborne imaging spectrometers DAEDALUS, DAIS and ROSIS

17. Authorisation

Mandator

I confirm that the information contained in the Technology Implementation Plan which is marked **CONFIDENTIAL / NO** may be disseminated by the Commission :

Name:	Drescher	Date:	22.1.2001
Organisation:	DLR Centre Oberpfaffenhofen, Institute of Remote Sensing Technology		

TECHNOLOGY IMPLEMENTATION PLAN

PART 2 – Project Results

A Framework for the further development and exploitation
of the results of EC RTD Projects

DOCUMENT TITLE: **Technology Implementation Plan** **PART 2 – Project Results**		
DATE: 01/04/00	**VERSION FP4 2.2**	**ORIGINATOR:** European Commission

Part 2a: Description of result* 4 Project Number: ENV4-CT97-0399

Please give information on each of the results chosen for a specific exploitation route. Refer to the guidelines for further details.

Table 6. Summary of exploitable result

Mandator

This information is for administration purposes only and will not be published.

Summarise exploitable result, identify the partners (result owners) involved and describe the exploitation intentions

Title of Result	Fuzzy logic contrail detection		
Partners involved	DLR IPA for testing the results		
Exploitation intention	Detection of contrails in satellite images		
Category	☒ Exploitable result used only within consortiums	☐ non exploitable result	☒ exploitable result of interest for third parties

(you can use free text in each table cell, but be as short and to the point as possible. In the **Category** cell tick the appropriate box, one box only)

7. Summary (200-300 words maximum)

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Provide an overview of the result which gives the reader an immediate impression of the nature of the result and its relevance and potential!

For the detection of contrails new mathematical methods are developed and applied for four different kinds of satellite images (AVHRR, MOS, MOMS, ATSR). Because edges and skeletons are not representative enough for the description and distinction of clouds, different stochastic properties in their combination are applied. The stochastic properties are represented mathematically by a system of coupled stochastic differential equations. Methods are developed to obtain estimation values from stochastic differential equations. The obtained solutions are given as sequential procedures using the grey values of neighbouring pixels. Because this is very time consuming, these procedures are approximated for usage of simpler array procedures working on the entire image.
For the combination of different kinds of stochastic properties and non-stochastic properties different kinds of properties are represented by a generalised measure. This is realised by a fuzzy measure and a fuzzy function, which is related to the selected fuzzy measure. Whereas the fuzzy function describes more isolated stochastic variations over selected regions, the fuzzy measures describe more extended regions by their stochastic properties. Both so represented stochastic properties are fused by a fuzzy integral. The obtained integral values are used as new fuzzy measures or fuzzy functions and generate iterative procedures to select desired properties for detection of contrails. The Lebesgue measure and integral describe the mixed pixels on the fuzzy boundary of the clouds. By this, features on the boundary of clouds are found and used for corresponding points. The methods are realised as algorithms and tested by IDL programs.

* - insert the number of the specific exploitable result

8. Description of result

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Mathematical methods for detection and discrimination of contrails or other clouds with characteristic texture properties are developed. It is shown, how models are developed and represented in form of a coupled system of stochastic differential equations. The approximated solution gives the expectation and stochastic values for description of contrails. The different kinds of properties are represented with the help of a measure theory by fuzzy measures and fuzzy function related to a measure. The properties are fused by the fuzzy integral. The important properties are isolated iterative and these procedures are adaptive controlled. For the description of boundaries of clouds, Lebesgue measures and Lebesgue functions are applied. The contours of the contrails are described by features, which are determined by the Lebesgue integral over selected points. These well-defined points are used for the estimation of the boundary of the clouds for masking and estimation of the heights using stereo images. Extended to the original objects also for detection of cirrus clouds algorithm are obtained.
For the Algorithm approximations are used, so that the original sequential procedures are transformed in fast procedures working on arrays and using built-in functions of the IDL-language. The algorithms are tested on four different types of satellite images (AVHRR, MOS, MOMS, ATSR). The algorithms are tested by samples of images by IDL-programs. Contrails are detected also if they are within clouds and for cirrus clouds.

Categorise subject description using codes from Annex 4.

Subject descriptor codes	C01	C06		

9. Current stage of development

CONFIDENTIAL
No
Select Yes/No from dropdown menu

STAGE OF DEVELOPMENT	Select one category only (tick the box)
Basic research	☒
Applied research	☒
Experimental development stage (Laboratory prototype)	☒
Prototype/demonstrator available for testing	☐
Results of demonstration trials available	☐
Other: (Please specify!)	☐

Briefly describe the current status/applications of the result!

Mathematical fundaments for the description of stochastic properties of contrails by fuzzy measures and the fusion of different kinds of properties by the fuzzy integral are obtained. Similar algorithms for the detection of cirrus clouds are derived. Algorithms and IDL programs for the detection of contrails exist in a test version for an application for four different kinds of satellite images. The effects are partially tested by the DLR-IPA . The programs detect contrails overlaid by other clouds and similar structures of the earth surface. The algorithms for the detection of cirrus clouds are applied for some examples of cirrus clouds. Examples of cirrus clouds are detected.

10. Documentation and information on exploitable result

Add here a list of the **most important and relevant** information and documentation, indicating the confidentiality status of each document. The "document status" box indicates whether the document being referred to is confidential (and might be made available to third parties only after the signing of a confidential disclosure agreement). The "confidentail" box indicates, whether the knowledge that a document exists is in itself confidential.
Add promotional material that can be used for illustrating the result in dissemination services such as photographs, items of artwork, video clip, interviews, piece of animation, etc.

Documentation type	Document Status **PU**=Public **CO**=Confidential	Details (Title, ref. number, general description, language)	CONFIDENTIAL Select Yes/No from dropdown menu
conference proceedings	PU	Hetzheim, H.: " Mathematical Theory and algorithms for the Detection of Contrails", EuropeanGeophysical Society, 24th General assembly of the European Geophysical Society, The Hague, April 1999 ; Geophysical Research Abstracts Vol. 1 No. 2 , 1999, p. 542.	No
conference proceedings	PU	Hetzheim, H. : Separation of different textures in images using fuzzy measures and fuzzy functions and their fusion by fuzzy integrals, Proc., ESIT'99, Crete, pp. 34-36 and CD, 4pp., June, 1999.	No
conference proceedings	PU	Hetzheim, H. "Analysis of hidden stochastic properties in images or curves by fuzzy measure and functions and their fusion by fuzzy or Choquet integrals", Proc. World Multiconf. Systemics,Cybernetics and Informatics, SCI'99 and ISAS'99 , Orlando, vol. 3, pp. 501-508,1999.	No
conference proceedings	PU	Hetzheim, H. " Fusion of Stochastic Properties by Fuzzy Integrals and Applications on Detection within Images",19th Congress of the International Society for Photogrammetry and Remote Sensing(ISPRS) International Archives of Photogrammetry and Remote Sensing, VolXXXIII, PartB7, Amsterdam 2000, pp. 533-540 on CD.	No
conference proceedings	PU	Hetzheim, H. :"Characterisation of Clouds and Their Heights by Texture Analysis of Multi-Spectral Stereo Images", IGARSS 2000 , July 2000, Honolulu, Hawaii, USA , Proceedings IGARSS 2000, 3 pages on CD.	No
conference proceedings	PU	Hetzheim, H. "Analysis of the shape of noise corrupted signals or spectra for comparison and feature extraction", 5th International Conference on Signal Processing, 16th World Computer Congress 2000, Aug.21-25, Beijing, Proceedings of ICSP 2000, vol. I, pp. 197-200, and 4 p. onCD, IEEE Press 2000.	No

conference proceedings	PU	Drescher, A., H. Hetzheim and J. Fischer: "New concepts for space-borne monitoring of drift and 3D-morphology of cloud fields for weather forecast and climate research, Proc. Internat. Symposium on earth observation systems for sustainable development, Bangalore, India,1998, pp.178-182.	No
			No
			No
			No
			No
			No
			No
			No
			No
			No

Part 2b: Exploitation of result

11. Exploitation strategy for the specific result

Mandator

11.1 Using the table below, indicate the intellectual and industrial property rights being exploited (all foreground and possible background rights)

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Type of IPR		Details (what is covered, reference numbers, countries covered) for all IPRs indicated in the Foreground (FG) and/or Background (BG) fields.	Number Fore-ground IPR's	Number Back-ground IPR's
Patent applied for	**FG**			
	BG			
Patent search carried out	**FG**			
	BG			
Patent obtained	**FG**	German Patent 198 10 162.7-53 H. Hetzheim, Verfahren und Vorrichtung zur Bildanalyse nach stochastischen Eigenschaften For the patent 5 of 6 claims are accepted by the German patent office		
	BG			
Registered design	**FG**			
	BG			
Trademark Applications	**FG**			
	BG			
Copyrights	**FG**			
	BG			
Secret know-how	**FG**			
	BG			
Other – Please specify	**FG**			
	BG			

Please enter in the "Details" field the information for **all** the IPR's. If you have more than one IPR per type

11.2 Define the role of each partner and the co-operation between the partners involved in the exploitation

CONFIDENTIAL
No
Select Yes/No from dropdown menu

The mathematical fundaments for representation and fusion of stochastic properties are developed without partners based on former scientific works. The models and the procedures are influenced by discussions with the other CLOUDMAP partners. The data of ATSR images and their reading procedures are obtained from UCL and DLR IPA. The MOS images and their reading programs were obtained by WEW of the FU Berlin. The fundaments for the interpretation and meteorological specific conditions are obtained in discussion with the IPA and the KMNI. Mr. A. Drescher, with DLR Planetary Exploration, Opto-Electronics now Methods of Remote Sensing, obtain the MOMS images and a selection of cirrus cloud images. The discussion with the other collaborators has clarified the problems and was important for the understanding of the special conditions for the development of contrails. A selection of AVHRR images with contrails is obtained by DLR IPA.

11.3 Collaboration sought

CONFIDENTIAL
No
Select Yes/No from dropdown menu

If you are looking for support by third parties, please indicate by using the keys or boxes below

KEY "Collaboration Sought"

R&D	☒	: Further research or development	JV	☐	: Joint venture
LIC	☐	: Licence agreement	MKT	☐	: Marketing agreement
MAN	☐	: Manufacturing agreement	FIN	☒	: Financial support
C	☐	: Venture Capital/spin-off funding	PPP	☒	: Private-public partnership
INFO	☒	: Information exchange	Other	☐	: (Please specify below)

Other:			

Describe the exploitation opportunity that you can offer your potential partner.

The mathematical methods and their adaptation to the detection of textures are new and can used by other partners. These methods are also applicable for other problems, which are influenced by stochastic properties such as decomposition of tissues by their stochastic properties, detection of disturbances on metallic surfaces and detection of smoke. The methods of description of stochastic properties, the decomposition and the fusion for new adapted properties can be used for the detection and separation of regions characterised by a special texture. Examples for this are contrails and cirrus clouds, detection of fire by smoke, irregularities by cutting processes, disturbances on fleece or silk, disturbances of glass in production of an optical equipment and detection of cancer cells in medical tissues. The methods for simplification of sequential procedures by array procedures can be used for selected cases of cloud detection. On an IDL program for the detection of contrails is shown how the algorithms are to realise in a program. The determination of isolated points for the description of cloud or other fuzzy boundaries by the Lebesgue measure and the Lebesgue integral is shown. This is used for the estimation of the extension of thin clouds and their height for stereo images.

12. Exploitation activities and timetable

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Describe the exploitation activities, the milestones involved and give a timetable (what will be done by whom and when?)

The results are represented in the CLOUDMAP meetings and given for the road show of the KMNI. The results are represented as oral presentation and paper in the proceedings on 7 international conferences. The IDL program are hand over the Institute of Atmospheric Physics for testing. The results can be used in CLOUDMAP 2 project.

Timetable:

Activity	Partner(s) involved	starting from ... to ...
Contrail detection in AVHRR images	DLR IPA (images selected)	Jun. 98 to Dec. 98
Contrail detection in MOS images	WEW FU Berlin (images selected)	Sept.99 to Dec. 99
Contrail/cirrus detect in MOMS images	DLR IPE (images selected)	Jul. 99 to Sept. 99
Contrail detection in ATSR images	DLR IPA (images selected)	Jul. 00 to Dec.00
		to
		to
		to
		to
		to
		to

13. Exploitation potential*

CONFIDENTIAL
No
Select Yes/No from dropdown menu

When describing the exploitation potential, you might want to consider one or all of the following factors:

- What are the potential applications for this result?
- Who are the users of this result?
- What are the main innovative features and benefits (technical/commercial success factors)?
- Analysis of the market sector
- Potential barriers

***** for PROSOMA users and those providing commercially relevant results, please concentrate on describing the business opportunity of your result***

The theoretical fundaments are based on new methods related to the estimation of stochastic properties, the representation of stochastic and non-stochastic properties of different kind by generalised measures and their fusion by the fuzzy integral. If the grey values of the pixels are fuzzy and have point structure, then methods with the help of the Lebesgue measure and Lebesgue integral are successful. In these images, where grey values are mixed by overlaid features of different kind, such as the contrails and deeper lying clouds, the values at the boundary are changed suddenly. Here, the point measures and the punctual integration by Lebesgue integrals give adequate results. For the estimation of regions with fuzzy structures, methods for estimation of a determined boundary are obtained.

The generalised algorithm allows wide spread exploitation potential for these results of detection and isolation of regions with a specific texture and is not only limited for the detection of contrails and cirrus clouds. Other clouds, such as normal clouds, smoke clouds or fog is detectable by this method. The methods and algorithm can be applied for all images where texture information is essential for the separation of regions. The models are general and can be straight modified for other applications. Other examples for this are medical images (slipped disks, cancer cells, and medical tissues), detection of disturbances on surfaces (metal, fleece or silk tissues), and separation of snow covered mountains from clouds and the detection of streaks in glass for a optical equipment. This method can also be used for the analysing of the state of the wood by analysing the change of the stochastic of images of the treetops of a wood taken from an aircraft.

Categorise market application sector using codes from Annex 5.

14. Ability of partners to carry out the exploitation

CONFIDENTIAL
No
Select Yes/No from dropdown menu

When describing this part, you might want to consider one or all of the following factors:

- Estimate the investment and describe the skills which will be required for exploitation of the result
- How do you intend to finance these investments?
- What is the expected return on investment?
- What risks are involved?

If you seek additional partners, clearly describe your input and the expected input from the external partner(s)!

For application of the methodical results only a normal PC will be needed. For some convenience the IDL language is useful, but also other languages are possible. The usage of these methods needs a practice in model building, such as the description by a system of stochastic differential equation. Here, the right choices of the number of coupled equation and the non-linearity, to describe far or short reaching effects are important. The solution of these equations is possible by an iteration of non-linear filtering. The best choice of the coefficients in the equations is obtained by testing the influence of the coefficients. If the influence is maximal, the best coefficients are obtained.

The estimation values are obtained by approximation with the martingale method. By this method the stochastic properties are hierarchical ordered by their innovative parts. Stochastic parts related to a small interval and subtracted from the original value describe the stochastic information. This description is continued until all stochastic parts related to a set of rising intervals are subtracted. These stochastic parts describe the properties for a selected region in the image. Here, the right elementary length of the interval is important.

The different kinds of properties are described by fuzzy measures and fuzzy functions. For the fuzzy function are to use properties, which are more given in points, whereas for the fuzzy measure properties are used, which are given in a closed region. The right choice of fuzzy function or fuzzy measure requires a good understanding of the function of the properties. For the fusion of the properties by the fuzzy integral a right cut level is needed. The results of the fuzzy integral can be used as a new fuzzy property. This is to do by a iterative process and for truncation an adaptive control is to use. This is also sensitive and a little intuition is needed for the choice of parameters for the control of the adaptive process. All other steps of the algorithms are more or less routine procedures.

15. Contact person for this exploitable result

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Name	Hetzheim
Position	Scientific co-worker
Organisation	DLR, Institute of Space Sensor Technology and Planetary Exploration
Address	D-12489 Berlin, Rutherfordstr. 2
Telephone	(30)67055 513
Fax	(30)67055 512
E-mail	hartwig.hetzheim@dlr.de

16. Organization information

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Provide a short description of your organization and if necessary, provide contact details on persons who are more involved in the exploitation aspects and/or the technical aspects.

DLR sees itself as a modern research enterprise.
In its strategic orientation, DLR focuses on integrating the potential of national and international endeavours involving partners from research institutions and industry. More information on web: http://www.dlr.de/forschung/inhr.htm;internal&LANGUAGE=en
The Institute of Space Sensor Technology and Planetary Exploration has 3 departments, department of planetary exploration,remote sensing and passive sensor systems.
The director of the Institute of Space Sensor Technology and Planetary Exploration is Prof. Dr. Gerhard Neukum.
More information on web , http://solarsystem.dlr.de/Welcome/.

17. Authorisation

Mandator

I confirm that the information contained in the Technology Implementation Plan which is marked **CONFIDENTIAL / NO** may be disseminated by the Commission :

Name: Hetzheim

Date: 4.1.2001

Organisation: DLR, Institute of Space Sensor Technology and Planetary Exploration

TECHNOLOGY IMPLEMENTATION PLAN

PART 2 – Project Results

A Framework for the further development and exploitation
of the results of EC RTD Projects

DOCUMENT TITLE: **Technology Implementation Plan** **PART 2 – Project Results**		
DATE: 01/04/00	**VERSION FP4 2.2**	**ORIGINATOR:** European Commission

Part 2a: Description of result* 5 Project Number: ENV4-CT97-0399

Please give information on each of the results chosen for a specific exploitation route. Refer to the guidelines for further details.

Table 6. Summary of exploitable result

Mandator

This information is for administration purposes only and will not be published.

Summarise exploitable result, identify the partners (result owners) involved and describe the exploitation intentions

Title of Result	Algorithm for the retrieval of cloud top pressure from satellite measurements
Partners involved	FUB, KNMI
Exploitation intention	Use within operational nowcasting, numerical weather prediction models, climatological studies
Category	☐ Exploitable result used only within consortiums ☐ non exploitable result ☒ exploitable result of interest for third parties

(you can use free text in each table cell, but be as short and to the point as possible. In the **Category** cell tick the appropriate box, one box only)

7. Summary (200-300 words maximum)

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Provide an overview of the result which gives the reader an immediate impression of the nature of the result and its relevance and potential!

The developed algorithm allows for the remote sensing of cloud top pressures in cloudy atmospheres from radiance measurements in the oxygen-A absorption band. The algorithm is applicable to a number of actual and planned satellites. Within the framework of this project, it was applied to measurements of the Modular Optoelectronic Scanner (MOS) and validated by comparison with radio soundings and by cross-validation with cloud top pressure information obtained with other sensors and techniques.
Clouds play an important role in the Earth-Atmosphere energy cycle, thus the exact knowledge of their properties is essential for climatological studies as well as for numerical weather prediction. As the developed algorithm can easily be adapted to existing and forthcoming satellites, it has the potential for a cloud top pressure retreival on a global scale with very high accuracy.

*** - insert the number of the specific exploitable result**

8. Description of result

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

The algorithm is based on radiative transfer simulations for a large number of cloudy atmospheres. Calculated radiances are used to simulate the spectral channels of the instrument to which the algorithm has been applied. The outcome of these simulations together with the information about the cloud top pressure for which the simulations are performed is used for the training and testing of a neural network. The trained network can then be applied to satellite measurements.
The radiative transfer simulations are performed in FORTRAN90, the training and testing of the neural network and its application to satellite data is realised with the Interactive Data Language (IDL).

Currently different algorithms for the remote sensing of cloud top pressure exist. Within the framework of this project the described algorithm was validated with radio soundings and a comparison of the different techniques is performed. The comparison with radio soundings showed an accuracy between 30 and 50 hPa, the comparison of the different retreival techniques will be described in detail in the final report.

Categorise subject description using codes from Annex 4.

Subject descriptor codes	C01	C06		

9. Current stage of development

CONFIDENTIAL
No
Select Yes/No from dropdown menu

STAGE OF DEVELOPMENT	Select one category only (tick the box)
Basic research	☐
Applied research	☐
Experimental development stage (Laboratory prototype)	☐
Prototype/demonstrator available for testing	☐
Results of demonstration trials available	☐
Other: (Please specify!)	☒

Briefly describe the current status/applications of the result!

The algorithm is routinely applied to measurements of the Modular Optoelectronic Scanner (MOS) and validated with radio soundings. It is also part of the processing scheme for the MERIS (MEdium Resolution Imaging Specrometer Instrument) that will be launched on EnviSat in July 2001.

10. Documentation and information on exploitable result

Add here a list of the **most important and relevant** information and documentation, indicating the confidentiality status of each document. The "document status" box indicates whether the document being referred to is confidential (and might be made available to third parties only after the signing of a confidential disclosure agreement). The "confidentail" box indicates, whether the knowledge that a document exists is in itself confidential.
Add promotional material that can be used for illustrating the result in dissemination services such as photographs, items of artwork, video clip, interviews, piece of animation, etc.

Documentation type	Document Status **PU**=Public **CO**=Confidential	Details (Title, ref. number, general description, language)	CONFIDENTIAL Select Yes/No from dropdown menu
Conference paper	PU	"Cloud top pressure retrieval from measurements within the O2A-band with the satellite imaging Sensor MERIS" published in: IEEE 1999 International Geoscience and Remote Sensing Symposium. IGARSS'99 (Cat. No.99CH36293) pp. 143-145, Vol. 1.	No
			No
			No
			No
			No
			No
			No
			No
			No
			No
			No
			No
			No
			No
			No
			No

Part 2b: Exploitation of result

11. Exploitation strategy for the specific result

Mandator

11.1 Using the table below, indicate the intellectual and industrial property rights being exploited (all foreground and possible background rights)

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Type of IPR		Details (what is covered, reference numbers, countries covered) for all IPRs indicated in the Foreground (FG) and/or Background (BG) fields.	Number Fore-ground IPR's	Number Back-ground IPR's
Patent applied for	**FG**			
	BG			
Patent search carried out	**FG**			
	BG			
Patent obtained	**FG**			
	BG			
Registered design	**FG**			
	BG			
Trademark Applications	**FG**			
	BG			
Copyrights	**FG**			
	BG			
Secret know-how	**FG**			
	BG			
Other – Please specify	**FG**			
	BG			0

Please enter in the "Details" field the information for **all** the IPR's. If you have more than one IPR per type (e.g. more than one patent), indicate in the "Nr of Foreground IPR's" and/or in the "Nr of Background IPR's fields" the respective numbers.

11.2 Define the role of each partner and the co-operation between the partners involved in the exploitation

CONFIDENTIAL
No
Select Yes/No from dropdown menu

FUB: Development of algorithm, application to satellite data.

KNMI: Evaluation of the potential end-use of product and technique by the European meteorological and climate research community.

11.3 Collaboration sought

CONFIDENTIAL
No
Select Yes/No from dropdown menu

If you are looking for support by third parties, please indicate by using the keys or boxes below

KEY "Collaboration Sought"

R&D	☐	: Further research or development	JV	☐	: Joint venture
LIC	☐	: Licence agreement	MKT	☐	: Marketing agreement
MAN	☐	: Manufacturing agreement	FIN	☐	: Financial support
C	☐	: Venture Capital/spin-off funding	PPP	☐	: Private-public partnership
INFO	☒	: Information exchange	Other	☐	: (Please specify below)

Other:			

Describe the exploitation opportunity that you can offer your potential partner.

12. Exploitation activities and timetable

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Describe the exploitation activities, the milestones involved and give a timetable (what will be done by whom and when?)

The task of KNMI within the CLOUDMAP consortium is to evaluate the potential end-use of CLOUDMAP products and techniques by the European meteorological and climate research community. For this purpose KNMI has performed a "roadshow" along relevant user-institutes in Europe. The roadshow consisted of five meetings, held in five different countries:

- Deutsche Wetterdienst (DWD) at Offenbach, Germany on September 19, 2000.
- Laboratoire de Météorologie Dynamique (LMD) in Paris, France on October 6, 2000.
- The Met Office in Bracknell, UK on October 13, 2000.
- Swedish Meteorological and Hydrological Institute (SMHI) in Norrköping, Sweden on October 19, 2000.
- Royal Netherlands Meteorological Institute (KNMI) in De Bilt, The Netherlands on November 22, 2000.

During these meetings the CLOUDMAP evaluators from KNMI have met potential end-users and experts on cloud information from satellites with the purpose to obtain feedback on the CLOUDMAP project and products itself and its applicability in real practice. Over a hundred people took part in the five different meetings.

Timetable:

Activity	Partner(s) involved	starting from ... to ...
R&D of CTP product in CLOUDMAP1	FUB	1/1/1998 to 1/1/2001
End use evaluation in CLOUDMAP1	KNMI	1/9/2000 to 1/12/2000
Refinement of CTP product in CLOUDMAP2	FUB	1/2/2001 to 1/2/2004
End use evaluation in CLOUDMAP2	KNMI	1/1/2003 to 1/1/2004
		to
		to
		to
		to
		to
		to

13. Exploitation potential*

CONFIDENTIAL
No
Select Yes/No from dropdown menu

When describing the exploitation potential, you might want to consider one or all of the following factors:

- What are the potential applications for this result?
- Who are the users of this result?
- What are the main innovative features and benefits (technical/commercial success factors)?
- Analysis of the market sector
- Potential barriers

**** for PROSOMA users and those providing commercially relevant results, please concentrate on describing the business opportunity of your result***

The "road-show" along end-users resulted in the following conclusions on the applicability and potential users of the product:
In the near future there will be a need for CTP data, independently observed from satellites, for application in Numerical Weather Prediction (NWP). The availability of a solid error structure of the CTH product is a necessity for successful application in NWP.
The climate research community has large interest in independently observed CTP data. However, the community sets high demands to a solid validation of the product before application in climate research will be accepted. At this stage of the CLOUDMAP project the validation of CTP products does not match this requirement.
The CLOUDMAP CTP product forms a potential independent data source for height assignment of cloud motion vectors (as used in NWP models).
Cloud top pressure (CTP) is not a key parameter in operational forecasting (cloud base height and the temporal development of clouds, e.g. CB's, has higher priority).

The main innovative feature and benefit of the CTP product (as derived from the O2 A technique) is that it is a independently derived product. Besides the satellite data, no additional information is needed. Moreover, the ability of the O2 A band technique to map correctly the CTP of Cirrus clouds forms a strong recommendation to use these techniques operationally since other data sources (both ground and space based) do not provide this information.

The scientific community in meteorology and climate research (national meteorological institutes and universities) will be the primary user of this product.

For a successful application of this CTP product in operational meteorological environments (forecasting, NWP) real-time accessibility and high data frequency (e.g. every hour) is needed. The current available O2 A band sensors can not meet the requirement.

Categorise market application sector using codes from Annex 5.

14. Ability of partners to carry out the exploitation

CONFIDENTIAL
No
Select Yes/No from dropdown menu

When describing this part, you might want to consider one or all of the following factors:

- Estimate the investment and describe the skills which will be required for exploitation of the result
- How do you intend to finance these investments?
- What is the expected return on investment?
- What risks are involved?

If you seek additional partners, clearly describe your input and the expected input from the external partner(s)!

The partners do not have plans (besides the activities as planned in the CLOUDMAP projects) to actively exploit the described product other than in scientific publications.

15. Contact person for this exploitable result

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Name	Hans Roozekrans
Position	Senior Scientist
Organisation	KNMI
Address	PO Box 201, 3730 AE De Bilt, The Netherlands
Telephone	+31 30 2206911
Fax	+31 30 2210407
E-mail	Hans.Roozekrans@knmi.nl

16. Organization information

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Provide a short description of your organization and if necessary, provide contact details on persons who are more involved in the exploitation aspects and/or the technical aspects.

The "Institut für Weltraumwissenschaften" is part of the Free University of Berlin. The institute has a long-year experience in the development and application of algorithms for the remote sensing of the atmosphere, lakes and ocean, using a radiative transport simulation scheme developed at the institute. Algorithms developed at the institute include the remote sensing of cloud top pressure, cloud microphysics, atmospheric water vapour, aerosols and oceanic constituents. The algorithms are applied to measurements taken either by spaceborne sensors or by spectrometers developed at the institute. In addition to ground based measurements, these instruments can also be used in the institute's research aereoplane.

The Royal Netherlands Meteorological Institute (KNMI) is a government-agency of the Ministry of Transport and Public Works. KNMI is the national meteorological centre for weather forecasts and climate research. KNMI provides vital weather and sea state information to ensure safety in sea and air traffic. Employing about 500 highly qualified staff, up-to-date technicians and international recognized scientists are supportive to the achievement of the mission. The scope of work does not only cover meteorology. KNMI has also great experience in atmospheric chemistry, geophysics, oceanography and satellite remote sensing.

17. Authorisation

Mandator

I confirm that the information contained in the Technology Implementation Plan which is marked **CONFIDENTIAL / NO** may be disseminated by the Commission :

Name: Prof. J. Fischer

Date: 01.02.01

Organisation: Institut für Weltraumwissenschaften, FU Berlin

TECHNOLOGY IMPLEMENTATION PLAN

PART 2 – Project Results

A Framework for the further development and exploitation of the results of EC RTD Projects

DOCUMENT TITLE: **Technology Implementation Plan** **PART 2 – Project Results**		
DATE: 01/04/00	**VERSION FP4 2.2**	**ORIGINATOR:** European Commission

Part 2a: Description of result* 6 Project Number: ENV4-CT97-0399

Please give information on each of the results chosen for a specific exploitation route. Refer to the guidelines for further details.

Table 6. Summary of exploitable result

Mandator

This information is for administration purposes only and will not be published.

Summarise exploitable result, identify the partners (result owners) involved and describe the exploitation intentions

Title of Result	Algorithm for the retrieval of cloud effective radius and cloud droplet concentration from satellite measurements
Partners involved	FUB, KNMI
Exploitation intention	Use within operational nowcasting, numerical weather prediction models, climatological studies
Category	☐ Exploitable result used only within consortiums ☐ non exploitable result ☒ exploitable result of interest for third parties

(you can use free text in each table cell, but be as short and to the point as possible. In the **Category** cell tick the appropriate box, one box only)

7. Summary (200-300 words maximum)

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Provide an overview of the result which gives the reader an immediate impression of the nature of the result and its relevance and potential!

The developed algorithm allows for the remote sensing of cloud effective radius and cloud droplet concentration from radiance measurements in the visible and near infrared spectral region. However, the retrieval is mostly restricted to maritime stratocumulus. The algorithm is applicable to a number of current and future satellite sensors. Within the frame of this project, it was applied to measurements of the Modular Optoelectronic Scanner (MOS).

Clouds play an important role in the Earth-Atmosphere energy cycle, thus the exact knowledge of their properties is essential for climatological studies as well as for numerical weather prediction. As the developed algorithm can easily be adapted to existing and forthcoming satellites, it has the potential for the retrieval of cloud microphysics on a global scale with very high accuracy.
The use of a conceptual model for droplet growth in marine boundary layer clouds led to a novel remote sensing technique that relates cloud radiative properties to a changed microphysical structure due to (anthropogenic) air pollution. This project demonstrated, that the findings could be used to monitor the effects of pollution on clouds and to track the sources of the pollution plumes.

*** - insert the number of the specific exploitable result**

8. Description of result

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

The algorithm is based on radiative transfer simulations for a large number of cloudy atmospheres. Calculated radiances are used to simulate the spectral channels of the instrument to which the algorithm has been applied. A conceptual model for cloud droplet growth in the radiative transfer simulations allow to remotely sense droplet concentration and geometrical thickness.
The outcome of these simulations together with the input values of droplet number concentration, droplet effective radius, geometrical thickness and optical thickness for which the simulations were performed is used for the training of an artificial neural network, that has been used as an efficient inversion technique with high performance. The trained network can then be applied to satellite measurements.
The radiative transfer code is written in FORTRAN90, the training and testing of the neural network and its application to satellite data and visualisation of the results is realised with the Interactive Data Language (IDL).

Within the framework of this project the described algorithm was validated against airborne in situ measurements of cloud microphysics and through comparison with back-trajectory calculation of the airmass origin in order to relate the level of pollution to the estimation mainly of droplet number concentration.

Categorise subject description using codes from Annex 4.

Subject descriptor codes	C01	C06		

9. Current stage of development

CONFIDENTIAL
No
Select Yes/No from dropdown menu

STAGE OF DEVELOPMENT	Select one category only (tick the box)
Basic research	☐
Applied research	☐
Experimental development stage (Laboratory prototype)	☐
Prototype/demonstrator available for testing	☐
Results of demonstration trials available	☐
Other: (Please specify!)	☒

Briefly describe the current status/applications of the result!

The algorithm is routinely applied to measurements of the Modular Optoelectronic Scanner (MOS).

10. Documentation and information on exploitable result

Add here a list of the **most important and relevant** information and documentation, indicating the confidentiality status of each document. The "document status" box indicates whether the document being referred to is confidential (and might be made available to third parties only after the signing of a confidential disclosure agreement). The "confidentail" box indicates, whether the knowledge that a document exists is in itself confidential.
Add promotional material that can be used for illustrating the result in dissemination services such as photographs, items of artwork, video clip, interviews, piece of animation, etc.

Documentation type	Document Status **PU**=Public **CO**=Confidential	Details (Title, ref. number, general description, language)	CONFIDENTIAL Select Yes/No from dropdown menu
article	PU	Brenguier, J.-L., P.Y. Chuang, Y. Fouquart, D.W. Johnson, F. Parol, H. Pawlowska, J. Pelon, L. Schüller, F. Schröder and J.R. Snider: An overview of the ACE-2 CLOUDYCOLUMN closure experiment, in: Tellus B, 52B, pp. 814-826, 2000	No
article	PU	Brenguier, H. Pawlowska, L. Schüller, R, Preusker, J. Fischer and Y. Fouquart: Radiative properties of boundary layer clouds: droplet effective radisu versus droplet conentration, in: J. Atmos. Sci., 57, pp. 803-821, 2000	No
article	PU	Schüller, L., W. Armbruster and J. Fischer: Retrieval of cloud optical and microphysical properties from multispectral radiances, in: Atmos. Res., 55, pp. 35-46, 2000	No
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			No
			No
			No
			No
			No
			No
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			No
			No
			No

Part 2b: Exploitation of result

11. Exploitation strategy for the specific result

Mandator

11.1 Using the table below, indicate the intellectual and industrial property rights being exploited (all foreground and possible background rights)

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Type of IPR		Details (what is covered, reference numbers, countries covered) for all IPRs indicated in the Foreground (FG) and/or Background (BG) fields.	Number Fore-ground IPR's	Number Back-ground IPR's
Patent applied for	FG			
	BG			
Patent search carried out	FG			
	BG			
Patent obtained	FG			
	BG			
Registered design	FG			
	BG			
Trademark Applications	FG			
	BG			
Copyrights	FG			
	BG			
Secret know-how	FG			
	BG			
Other – Please specify	FG			
	BG			0

Please enter in the "Details" field the information for **all** the IPR's. If you have more than one IPR per type (e.g. more than one patent), indicate in the "Nr of Foreground IPR's" and/or in the "Nr of Background IPR's fields" the respective numbers.

11.2 Define the role of each partner and the co-operation between the partners involved in the exploitation

CONFIDENTIAL
No
Select Yes/No from dropdown menu

FUB: Development of algorithm, application to satellite data.

KNMI: Evaluation of the potential end-use of product and technique by the European meteorological and climate research community.

11.3 Collaboration sought

CONFIDENTIAL
No
Select Yes/No from dropdown menu

If you are looking for support by third parties, please indicate by using the keys or boxes below

KEY "Collaboration Sought"

R&D	☐	: Further research or development	JV	☐	: Joint venture
LIC	☐	: Licence agreement	MKT	☐	: Marketing agreement
MAN	☐	: Manufacturing agreement	FIN	☐	: Financial support
C	☐	: Venture Capital/spin-off funding	PPP	☐	: Private-public partnership
INFO	☒	: Information exchange	Other	☐	: (Please specify below)

Other:			

Describe the exploitation opportunity that you can offer your potential partner.

12. Exploitation activities and timetable

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Describe the exploitation activities, the milestones involved and give a timetable (what will be done by whom and when?)

The task of KNMI within the CLOUDMAP consortium is to evaluate the potential end-use of CLOUDMAP products and techniques by the European meteorological and climate research community. For this purpose KNMI has performed a "roadshow" along relevant user-institutes in Europe. The roadshow consisted of five meetings, held in five different countries:

- Deutsche Wetterdienst (DWD) at Offenbach, Germany on September 19, 2000.
- Laboratoire de Météorologie Dynamique (LMD) in Paris, France on October 6, 2000.
- The Met Office in Bracknell, UK on October 13, 2000.
- Swedish Meteorological and Hydrological Institute (SMHI) in Norrköping, Sweden on October 19, 2000.
- Royal Netherlands Meteorological Institute (KNMI) in De Bilt, The Netherlands on November 22, 2000.

During these meetings the CLOUDMAP evaluators from KNMI have met potential end-users and experts on cloud information from satellites with the purpose to obtain feedback on the CLOUDMAP project and products itself and its applicability in real practice. Over a hundred people took part in the five different meetings.

Timetable:

Activity	Partner(s) involved	starting from ... to ...
R&D of microphysical cloud parameters in CLOUDMAP1 project	FUB	1/1/1998 to 1/1/2001
End use evaluation of product in CLOUDMAP1 project	KNMI	1/9/2000 to 1/12/2000
Refinement of product in CLOUDMAP2	FUB	1/2/2001 to 1/2/2004
End use evaluation of improved product in CLOUDMAP2	KNMI	1/1/2003 to 1/1/2004
		to
		to
		to
		to
		to
		to

13. Exploitation potential*

CONFIDENTIAL
No
Select Yes/No from dropdown menu

When describing the exploitation potential, you might want to consider one or all of the following factors:

· What are the potential applications for this result?
· Who are the users of this result?
· What are the main innovative features and benefits (technical/commercial success factors)?
· Analysis of the market sector
· Potential barriers

***** for PROSOMA users and those providing commercially relevant results, please concentrate on describing the business opportunity of your result***

The "road-show" along end-users resulted in the following conclusions on the applicability and potential users of the product:
Operational weather forecasters and climate researchers show a large interest in microphysical cloud parameters (effective radius and droplet concentration) as can be derived using the O2 A band technique. The O2 A band technology should be considered for inclusion in future operational meteorological imaging satellite sensors.
The current Numerical Weather Prediction (NWP) models are not yet ready for the assimilation of microphysical cloud parameters. First, new parameterisation and assimilation schemes in the NWP models need to be researched and developed. CLOUDMAP products can contribute to this R&D work.

Application fields of current microphysical cloud products (based on the MOS O2 A band):
• NWP model parameterisation.
• Climate research (all types of use).

In case an O2 A band becomes available on future operational meteorological satellites (providing adequate timeliness and data frequency) more application fields become feasible:
• Aviation forecasting/nowcasting.
• Real-time NWP model check/validation.
• NWP model initialisation.

During the evaluation work within CLOUDMAP the application of O2 A band products for the validation of operational satellite cloud products have been identified, e.g.:
_ EUMETSAT MPEF products.
_ Nowcasting + Climate SAF products.

Categorise market application sector using codes from Annex 5.

14. Ability of partners to carry out the exploitation

CONFIDENTIAL
No
Select Yes/No from dropdown menu

When describing this part, you might want to consider one or all of the following factors:

- Estimate the investment and describe the skills which will be required for exploitation of the result
- How do you intend to finance these investments?
- What is the expected return on investment?
- What risks are involved?

If you seek additional partners, clearly describe your input and the expected input from the external partner(s)!

The partners do not have plans (besides the activities as planned in the CLOUDMAP projects) to actively exploit the described product other than in scientific publications.

15. Contact person for this exploitable result

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Name	Hans Roozekrans
Position	Senior Scientist
Organisation	KNMI
Address	PO Box 201, 3730 AE De Bilt, The Netherlands
Telephone	+31 30 2206911
Fax	+31 30 2210407
E-mail	Hans.Roozekrans@knmi.nl

16. Organization information

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Provide a short description of your organization and if necessary, provide contact details on persons who are more involved in the exploitation aspects and/or the technical aspects.

The "Institut für Weltraumwissenschaften" is part of the Free University Berlin. The institute has a long-year experience in the development and application of algorithms for the remote sensing of the atmosphere, lakes and ocean, using a radiative transport simulation scheme developed at the institute. Algorithms developed at the institute include the remote sensing of cloud top pressure, cloud microphysics, atmospheric water vapour, aerosols and oceanic constituents. The algorithms are applied to measurements taken either by spaceborne sensors or by spectrometers developed at the institute. In addition to ground based measurements, these instruments can also be used in the institut's research aereoplane.

The Royal Netherlands Meteorological Institute (KNMI) is a government-agency of the Ministry of Transport and Public Works. KNMI is the national meteorological centre for weather forecasts and climate research. KNMI provides vital weather and sea state information to ensure safety in sea and air traffic. Employing about 500 highly qualified staff, up-to-date technicians and international recognized scientists are supportive to the achievement of the mission. The scope of work does not only cover meteorology. KNMI has also great experience in atmospheric chemistry, geophysics, oceanography and satellite remote sensing.

17. Authorisation

Mandator

I confirm that the information contained in the Technology Implementation Plan which is marked **CONFIDENTIAL / NO** may be disseminated by the Commission :

Name: Prof. J. Fischer

Date: 01.02.01

Organisation: Institut für Weltraumwissenschaften, FU Berlin

TECHNOLOGY IMPLEMENTATION PLAN

PART 2 – Project Results

A Framework for the further development and exploitation of the results of EC RTD Projects

DOCUMENT TITLE: Technology Implementation Plan PART 2 – Project Results		
DATE: 01/04/00	**VERSION FP4 2.2**	**ORIGINATOR:** European Commission

Part 2a: Description of result* 7 Project Number: ENV4 CT97-0399

Please give information on each of the results chosen for a specific exploitation route. Refer to the guidelines for further details.

Table 6. Summary of exploitable result

Mandator

This information is for administration purposes only and will not be published.

Summarise exploitable result, identify the partners (result owners) involved and describe the exploitation intentions

Title of Result	Ground-based sky imager system
Partners involved	ETH
Exploitation intention	no
Category	☐ Exploitable result used only within consortiums ☐ non exploitable result ☒ exploitable result of interest for third parties

(you can use free text in each table cell, but be as short and to the point as possible. In the **Category** cell tick the appropriate box, one box only)

7. Summary (200-300 words maximum)

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Provide an overview of the result which gives the reader an immediate impression of the nature of the result and its relevance and potential!

A ground-based sky imager system consisting of two commercial digital CCD cameras with wide-angle lenses has been developed. The system can be used to derive various macroscopic cloud parameters: cloud amount, cloud-base heights and cloud-base wind (for every visible cloud layer). The method to calculate a digital surface model (DSM) of the cloud-base is presented. It includes the precise determination of the interior and exterior orientation of the cameras, which have been carried out with a close-range photogrammetric testfield, stars and special airplane flights (equipped with Differential GPS). Cloud-base heights have been derived automatically using commercial digital photogrammetric systems and own software (see TIP for "cloud-adapted matching algorithm").

The ground measurements with our new stereo camera system showed to be an interesting technique to validate satellite-based cloud-top heights of vertically thin clouds and detect smaller scale cloud features, which is important for accurate nowcasting, especially in mountainous terrain. Furthermore, it showed to be a valuable instrument within a composite ground observing network during the MAP (Mesoscale Alpine Programme) field campaign.

* - insert the number of the specific exploitable result

8. Description of result

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

The two camera locations are separated by about 1000m horizontally. The relatively short distance makes it possible to stereo analyse also low clouds. The choice of an appropriate base length for cloud mapping is difficult because of the wide height range of clouds. A flexible base length with respect to the current cloud height range will be realized in the future with multiple cameras.
Each camera system consists of a KODAK DCS460 colour digital CCD camera connected via SCSI interface to a laptop with precise time information (GPS receiver or radio clock). The shutter release is controlled from the laptop. The camera is mounted on a adapted theodolite tripod which allows precise horizontal adjustment of the camera with levelling screws and with the use of an electronic levelling instrument on the lens. The tripod has a moving sun occultator device (which can be used against image blooming caused by the sun) and a small heating device to stabilise the camera against temperature and humidity variations during longer image series and during the night image acquisition. A Nikon 18mm wide-angle lens with a nominal viewing angle of 100° is used.
The camera's CCD array has a size of 3072x2048 pixels with a Bayer colour filter. The RGB values (8-bit per colour) of each pixel are calculated with KODAK's proprietary Active Interpolation algorithm from the originally 8-bit red, green and blue filter values. The dark current noise of this sensor is quite substantial and influences especially the long exposure time night images which are used for exterior orientation with stars. Therefore, images with the lens cap closed have to be taken at various exposure times (between about 0.002 and 240 seconds) for each camera to analyze the dark current noise.
The inner orientation parameters (focal length, principal point offsets, radial and decentering distortion) of each camera are determined with a close-range photogrammetric testfield at ETH.
The exterior orientation is calculated with a bundle adjustment using sky control points. Two independent sets of sky control points were used: airplane (equipped with Differential GPS), on various flight altitudes, and stars.

Categorise subject description using codes from Annex 4.

Subject descriptor codes	C01	C06		

9. Current stage of development

CONFIDENTIAL
No
Select Yes/No from dropdown menu

STAGE OF DEVELOPMENT	Select one category only (tick the box)
Basic research	☐
Applied research	☒
Experimental development stage (Laboratory prototype)	☐
Prototype/demonstrator available for testing	☐
Results of demonstration trials available	☐
Other: (Please specify!)	☐

Briefly describe the current status/applications of the result!

A prototype system was used during the field campaign of MAP (Mesoscale Alpine Programme) in autumn 1999. Currently, other cameras and sensors are evaluated for the new version of the system.

10. Documentation and information on exploitable result

Add here a list of the **most important and relevant** information and documentation, indicating the confidentiality status of each document. The "document status" box indicates whether the document being referred to is confidential (and might be made available to third parties only after the signing of a confidential disclosure agreement). The "confidentail" box indicates, whether the knowledge that a document exists is in itself confidential.
Add promotional material that can be used for illustrating the result in dissemination services such as photographs, items of artwork, video clip, interviews, piece of animation, etc.

Documentation type	Document Status **PU**=Public **CO**=Confidential	Details (Title, ref. number, general description, language)	CONFIDENTIAL Select Yes/No from dropdown menu
Paper	PU	Seiz, G., Baltsavias, E.P., 2000. Cloud mapping using ground-based imagers. International Archives of Photogrammetry and Remote Sensing, Vol. 33, Part B7/4, pp. 1349-1356.	No
			No
			No
			No
			No
			No
			No
			No
			No
			No
			No
			No
			No
			No
			No
			No

Part 2b: Exploitation of result

11. Exploitation strategy for the specific result

Mandator

11.1 Using the table below, indicate the intellectual and industrial property rights being exploited (all foreground and possible background rights)

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Type of IPR		Details (what is covered, reference numbers, countries covered) for all IPRs indicated in the Foreground (FG) and/or Background (BG) fields.	Number Fore-ground IPR's	Number Back-ground IPR's
Patent applied for	**FG**			
	BG			
Patent search carried out	**FG**			
	BG			
Patent obtained	**FG**			
	BG			
Registered design	**FG**			
	BG			
Trademark Applications	**FG**			
	BG			
Copyrights	**FG**			
	BG			
Secret know-how	**FG**			
	BG			
Other – Please specify	**FG**			
	BG			

Please enter in the "Details" field the information for **all** the IPR's. If you have more than one IPR per type (e.g. more than one patent), indicate in the "Nr of Foreground IPR's" and/or in the "Nr of Background IPR's fields" the respective numbers.

11.2 Define the role of each partner and the co-operation between the partners involved in the exploitation

CONFIDENTIAL
No
Select Yes/No from dropdown menu

11.3 Collaboration sought

CONFIDENTIAL
No
Select Yes/No from dropdown menu

If you are looking for support by third parties, please indicate by using the keys or boxes below

KEY "Collaboration Sought"

R&D	☐	: Further research or development	JV	☐	: Joint venture
LIC	☐	: Licence agreement	MKT	☐	: Marketing agreement
MAN	☐	: Manufacturing agreement	FIN	☐	: Financial support
C	☐	: Venture Capital/spin-off funding	PPP	☐	: Private-public partnership
INFO	☐	: Information exchange	Other	☐	: (Please specify below)

Other:			

Describe the exploitation opportunity that you can offer your potential partner.

12. Exploitation activities and timetable

Mandator

CONFIDENTIAL

No

Select Yes/No from dropdown menu

Describe the exploitation activities, the milestones involved and give a timetable (what will be done by whom and when?)

Timetable:

Activity	Partner(s) involved	starting from ... to ...
		to
		to
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		to

13. Exploitation potential*

CONFIDENTIAL
No
Select Yes/No from dropdown menu

When describing the exploitation potential, you might want to consider one or all of the following factors:

- What are the potential applications for this result?
- Who are the users of this result?
- What are the main innovative features and benefits (technical/commercial success factors)?
- Analysis of the market sector
- Potential barriers

**** for PROSOMA users and those providing commercially relevant results, please concentrate on describing the business opportunity of your result***

Categorise market application sector using codes from Annex 5.

14. Ability of partners to carry out the exploitation

CONFIDENTIAL
No
Select Yes/No from dropdown menu

When describing this part, you might want to consider one or all of the following factors:

- Estimate the investment and describe the skills which will be required for exploitation of the result
- How do you intend to finance these investments?
- What is the expected return on investment?
- What risks are involved?

If you seek additional partners, clearly describe your input and the expected input from the external partner(s)!

15. Contact person for this exploitable result

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Name	Hans Roozekrans
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Telephone	+31 30 2206911
Fax	+31 30 2210407
E-mail	Hans.Roozekrans@knmi.nl

16. Organization information

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Provide a short description of your organization and if necessary, provide contact details on persons who are more involved in the exploitation aspects and/or the technical aspects.

17. Authorisation

Mandator

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Name: Date:

Organisation:

TECHNOLOGY IMPLEMENTATION PLAN

PART 2 – Project Results

A Framework for the further development and exploitation of the results of EC RTD Projects

DOCUMENT TITLE: Technology Implementation Plan PART 2 – Project Results		
DATE: 01/04/00	**VERSION FP4 2.2**	**ORIGINATOR:** European Commission

Part 2a: Description of result* 8 Project Number: ENV4 CT97-0399

Please give information on each of the results chosen for a specific exploitation route. Refer to the guidelines for further details.

Table 6. Summary of exploitable result

Mandator

This information is for administration purposes only and will not be published.

Summarise exploitable result, identify the partners (result owners) involved and describe the exploitation intentions

Title of Result	Sensor model for cloud-top height estimation from multi-line CCD sensors
Partners involved	ETH
Exploitation intention	no
Category	☒ Exploitable result used only within consortiums ☐ non exploitable result ☐ exploitable result of interest for third parties

(you can use free text in each table cell, but be as short and to the point as possible. In the **Category** cell tick the appropriate box, one box only)

7. Summary (200-300 words maximum)

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Provide an overview of the result which gives the reader an immediate impression of the nature of the result and its relevance and potential!

Multi-line CCD sensors carried on spacecraft are very important for cloud-top height estimation with a photogrammetric approach, because they provide stereo images at very high temporal resolution, thanks to their along-track stereo capabilities. An example of these sensors is the Multi-angle Imaging SpectroRadiometer instrument (MISR), carried on EOS-AM1 (TERRA) spacecraft, which consists of nine-pushbroom cameras oriented at different angles along-track.
In order to estimate cloud-top height from these CCD linear optical sensors, a mathematical model describing the geometry of the sensor and the relations between image and ground coordinates is used. Points are recognized in two or more stereo images and their position measured with matching. For each point, all the image coordinates are projected into the ground coordinate system, using collinearity equations, and the 3-D ground coordinates of the point are estimated with least square solution. If the external orientation (position and attitude) is provided by ephemeris information or on-board measurements, no ground control points are needed. The same method is used to estimate the height of points on clouds. In this case, a more complex matching tool (see TIP for "Cloud-Adapted Matching Algorithm") must be used in order to solve problems due to the low texture and discontinuous form of the clouds.

*** - insert the number of the specific exploitable result**

8. Description of result

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

A full path from the nine lens of MISR sensors have been provided by NASA. The path is at the original level, not georeferenced (level 1B1 product), so the sensor model developped at our institute can be used to estimate point coordinates. By the current time, we are processing the path; only a block over central Europe will be used. Corresponding points will be identified in the 9 images and their height estimated.
In the meantime, existing sensor models for some CCD linear sensor have been studied and tested for cloud-top height estimation.
In particular, we studied Kratky's sensor model, which is designed for linear CCD sensors. Cloud-top height was estimated from a stereopair from MOMS sensor, carried on MIR station during PRIRODA mission. The sensor consists of three CCD lines, with along-track stereo viewing (+/- 21.4 and 0 degrees). Only the two off-nadir images, with a ground resolution of 18m, were processed. Ground control points (GCPs) were also available. 10 GCPs were used to orient the stereo pair with Kratky's sensor model and estimate the exterior orientation. Then 9000 points were selected with Foestner operator, automatically identified in both images and their 3D coordinates calculated. For the estimation of cloud-top heights, the images were resampled to 288m and a geometrically constrained least square matching was used to measure the image coordinates. Matching led to large blunders in land areas between clouds or close to cloud boundaries. Excluding these blunders (error > 1100m), matching showed an RMS of ca. 0.2 pixel, exhibiting that photogrammetric methods have a very high accuracy potential.

Categorise subject description using codes from Annex 4.

Subject descriptor codes	D30	C01	C06	

9. Current stage of development

CONFIDENTIAL
No
Select Yes/No from dropdown menu

STAGE OF DEVELOPMENT	Select one category only (tick the box)
Basic research	☐
Applied research	☒
Experimental development stage (Laboratory prototype)	☐
Prototype/demonstrator available for testing	☐
Results of demonstration trials available	☐
Other: (Please specify!)	☐

Briefly describe the current status/applications of the result!

By the current time, the full path from MISR sensor is under processing. Only a block over Europe will be taken into account; common points will be idntified in the stereo images and the model applied. Moreover, the sensor model is being tested on a sensor with analogue characteristics of MISR, but carried on airborne (ADS40).

10. Documentation and information on exploitable result

Add here a list of the **most important and relevant** information and documentation, indicating the confidentiality status of each document. The "document status" box indicates whether the document being referred to is confidential (and might be made available to third parties only after the signing of a confidential disclosure agreement). The "confidentail" box indicates, whether the knowledge that a document exists is in itself confidential.
Add promotional material that can be used for illustrating the result in dissemination services such as photographs, items of artwork, video clip, interviews, piece of animation, etc.

Documentation type	Document Status **PU**=Public **CO**=Confidential	Details (Title, ref. number, general description, language)	CONFIDENTIAL Select Yes/No from dropdown menu
Paper	PU	Poli, D. et al. Cloud-top heigth estimation from satellite sensors for weather forecasting and cimate change analysis. International Archives of Photogrammetry and Remote Sensing, Vol.XXXIII, part B7/3, pp.1162-1169, in English.	No
			No
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Part 2b: Exploitation of result

11. Exploitation strategy for the specific result

Mandator

11.1 Using the table below, indicate the intellectual and industrial property rights being exploited (all foreground and possible background rights)

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Type of IPR		**Details (what is covered, reference numbers, countries covered) for all IPRs indicated in the Foreground (FG) and/or Background (BG) fields.**	**Number Fore-ground IPR's**	**Number Back-ground IPR's**
Patent applied for	**FG**			
	BG			
Patent search carried out	**FG**			
	BG			
Patent obtained	**FG**			
	BG			
Registered design	**FG**			
	BG			
Trademark Applications	**FG**			
	BG			
Copyrights	**FG**			
	BG			
Secret know-how	**FG**			
	BG			
Other – Please specify	**FG**			
	BG			

Please enter in the "Details" field the information for **all** the IPR's. If you have more than one IPR per type (e.g. more than one patent), indicate in the "Nr of Foreground IPR's" and/or in the "Nr of Background IPR's fields" the respective numbers.

11.2 Define the role of each partner and the co-operation between the partners involved in the exploitation

CONFIDENTIAL
No
Select Yes/No from dropdown menu

11.3 Collaboration sought

CONFIDENTIAL
No
Select Yes/No from dropdown menu

If you are looking for support by third parties, please indicate by using the keys or boxes below

KEY "Collaboration Sought"

R&D	☐	: Further research or development	JV	☐	: Joint venture
LIC	☐	: Licence agreement	MKT	☐	: Marketing agreement
MAN	☐	: Manufacturing agreement	FIN	☐	: Financial support
C	☐	: Venture Capital/spin-off funding	PPP	☐	: Private-public partnership
INFO	☐	: Information exchange	Other	☐	: (Please specify below)

Other:			

Describe the exploitation opportunity that you can offer your potential partner.

12. Exploitation activities and timetable

Mandator

CONFIDENTIAL

No

Select Yes/No from dropdown menu

Describe the exploitation activities, the milestones involved and give a timetable (what will be done by whom and when?)

Timetable:

Activity	Partner(s) involved	starting from ... to ...
		to
		to
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13. Exploitation potential*

CONFIDENTIAL
No
Select Yes/No from dropdown menu

When describing the exploitation potential, you might want to consider one or all of the following factors:

- What are the potential applications for this result?
- Who are the users of this result?
- What are the main innovative features and benefits (technical/commercial success factors)?
- Analysis of the market sector
- Potential barriers

**** for PROSOMA users and those providing commercially relevant results, please concentrate on describing the business opportunity of your result***

Categorise market application sector using codes from Annex 5.

14. Ability of partners to carry out the exploitation

CONFIDENTIAL

No

Select Yes/No from dropdown menu

When describing this part, you might want to consider one or all of the following factors:

- Estimate the investment and describe the skills which will be required for exploitation of the result
- How do you intend to finance these investments?
- What is the expected return on investment?
- What risks are involved?

If you seek additional partners, clearly describe your input and the expected input from the external partner(s)!

15. Contact person for this exploitable result

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Name	Hans Roozekrans
Position	Senior Scientist
Organisation	KNMI
Address	PO Box 201, 3730 AE De Bilt, The Netherlands
Telephone	+31 30 2206911
Fax	+31 30 2210407
E-mail	Hans.Roozekrans@knmi.nl

16. Organization information

Mandator

CONFIDENTIAL
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Select Yes/No from dropdown menu

Provide a short description of your organization and if necessary, provide contact details on persons who are more involved in the exploitation aspects and/or the technical aspects.

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TECHNOLOGY IMPLEMENTATION PLAN

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DOCUMENT TITLE: Technology Implementation Plan PART 2 – Project Results		
DATE: 01/04/00	**VERSION FP4 2.2**	**ORIGINATOR:** European Commission

Part 2a: Description of result* 9 Project Number: ENV4 CT97-0399

Please give information on each of the results chosen for a specific exploitation route. Refer to the guidelines for further details.

Table 6. Summary of exploitable result

Mandator

This information is for administration purposes only and will not be published.

Summarise exploitable result, identify the partners (result owners) involved and describe the exploitation intentions

Title of Result	Cloud-adapted matching algorithm		
Partners involved	ETH		
Exploitation intention	no		
Category	☐ Exploitable result used only within consortiums	☒ non exploitable result	☐ exploitable result of interest for third parties

(you can use free text in each table cell, but be as short and to the point as possible. In the **Category** cell tick the appropriate box, one box only)

7. Summary (200-300 words maximum)

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Provide an overview of the result which gives the reader an immediate impression of the nature of the result and its relevance and potential!

Matching of clouds presents various problems: low texture or saturation at clouds, small signal-to-noise ratio, poor definition of cloud edges, discontinuous, transparent or semi-transparent surfaces, illumination differences, perspective differences and occlusions. Some of these difficulties cannot be handled in a sufficient way by the existing algorithms. Therefore, a so-called cloud-adapted matching algorithm is developed. It consists of five steps:

- image preprocessing
- feature extraction in first image (template)
- approximation of same features in second image (patch)
- hierarchical matching
- quality control.

*** - insert the number of the specific exploitable result**

8. Description of result

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

At first, the images are preprocessed to optimize the conditions for the matching algorithm. Preprocessing of the images should detect and reduce sensor artefacts and sharpen the effective image information. For the satellite images, it includes, for example, destriping (MOMS) or median filtering (ATSR2) as well as contrast enhancement and radiometric equalization. For the ground-based images, it includes, in addition, the analysis of the flat field and the colour filter of the camera.
After preprocessing, various feature extraction algorithms are applied on the images to retrieve distinct point and edge features. All these operators have to work with dynamic thresholds as the result of the operators can be very different in various cloud regions. A first rough cloud segmentation is done during this step as well.
The most problematic step of the new algorithm is the determination of a first approximation of a distinct feature of the first image (template) in the second image (patch). At the moment, multiple pyramid levels are used to reduce the maximum parallax to within 2-3 pixels which corresponds about to the maximal convergence radius of the least-square matching (LSM) algorithm.
The Multiphoto Geometrically Constrained Least-Square Matching (MPGC) developed at our institute is used in the matching step.
The quality control consists of absolute (=fixed thresholds) and relative tests on the least-squares matching (LSM) statistics (eg sigma0, correlation coefficient, shifts, shear, etc.). Furthermore, an algorithm for the combination of the results from two (or more) parameter versions is developed.

Categorise subject description using codes from Annex 4.

Subject descriptor codes	C01	C06	D11	D29

9. Current stage of development

CONFIDENTIAL
No
Select Yes/No from dropdown menu

STAGE OF DEVELOPMENT	Select one category only (tick the box)
Basic research	☐
Applied research	☒
Experimental development stage (Laboratory prototype)	☐
Prototype/demonstrator available for testing	☐
Results of demonstration trials available	☐
Other: (Please specify!)	☐

Briefly describe the current status/applications of the result!

The cloud-adapted matching algorithm was already tested with MOMS, ATSR2 and ground-based stereo images. Further data from MISR, ASTER and the new ground-based sky camera system (see TIP of "ground-based sky imager system") are used for further tests of the algorithm in the near future.

10. Documentation and information on exploitable result

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Documentation type	Document Status **PU**=Public **CO**=Confidential	Details (Title, ref. number, general description, language)	CONFIDENTIAL Select Yes/No from dropdown menu
			No
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			No
			No
			No

Part 2b: Exploitation of result

11. Exploitation strategy for the specific result

Mandator

11.1 Using the table below, indicate the intellectual and industrial property rights being exploited (all foreground and possible background rights)

CONFIDENTIAL
No
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	BG			
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	BG			
Patent obtained	**FG**			
	BG			
Registered design	**FG**			
	BG			
Trademark Applications	**FG**			
	BG			
Copyrights	**FG**			
	BG			
Secret know-how	**FG**			
	BG			
Other – Please specify	**FG**			
	BG			

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11.2 Define the role of each partner and the co-operation between the partners involved in the exploitation

CONFIDENTIAL
No
Select Yes/No from dropdown menu

11.3 Collaboration sought

CONFIDENTIAL
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KEY "Collaboration Sought"

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C	☐	: Venture Capital/spin-off funding	PPP	☐	: Private-public partnership
INFO	☐	: Information exchange	Other	☐	: (Please specify below)

Other:			

Describe the exploitation opportunity that you can offer your potential partner.

12. Exploitation activities and timetable

Mandator

CONFIDENTIAL

No

Select Yes/No from dropdown menu

Describe the exploitation activities, the milestones involved and give a timetable (what will be done by whom and when?)

Timetable:

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		to
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13. Exploitation potential*

CONFIDENTIAL
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Select Yes/No from dropdown menu

When describing the exploitation potential, you might want to consider one or all of the following factors:

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- Potential barriers

**** for PROSOMA users and those providing commercially relevant results, please concentrate on describing the business opportunity of your result***

Categorise market application sector using codes from Annex 5.

14. Ability of partners to carry out the exploitation

CONFIDENTIAL
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- What risks are involved?

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15. Contact person for this exploitable result

Mandator

CONFIDENTIAL
No
Select Yes/No from dropdown menu

Name	Hans Roozekrans
Position	Senior Scientist
Organisation	KNMI
Address	PO Box 201, 3730 AE De Bilt, The Netherlands
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Mandator

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