Observing Cycles, Seasons, and Storms

Recent observational findings suggest that the 11(-ish) solar sunspot cycle is a pattern resulting from interaction, or interference, of large scale magnetic field bands that evolve within the Sun's convective interior over its 22-year magnetic polarity reversal cycle. These toroidal magnetic bands are anchored deep in the solar convection zone and migrate from high latitudes to the equator over 22 years, and new analysis techniques have allowed us to trace their migration from birth to death. We will see that the spatio-temporal interaction of these magnetic bands helps us frame the landmarks of the sunspot cycle with a surprising realization that, once considered, permits a deeper look into the gross energetics of the star, its radiative, particulate and eruptive output and how they vary with time. It is possible that, with refinements and an ongoing commitment to synoptic observational programs, these results offer greatly improved forecast skill on monthly, annual and decadal timescales while a comprehensive physical model can be developed.