The magnetic Sun-as-a-star and the solar cycle in the eyes of Zeeman-Doppler-Imaging

The method of choice to analyse the magnetic field of stars is often the Zeeman-Doppler-Imaging (ZDI) providing the vector magnetic field map of the stellar surface. However, ZDI detects only the large-scale field as within the resolution elements magnetic features of opposite polarity cancel. This stands in huge contrast to the magnetic picture, we see for our Sun, where we can observe the magnetic field in incredible spatially and temporally resolution. Furthermore, we are reaching the point where spectropolarimetric surveys have run for long enough to reveal solar-like magnetic activity cycles, which opens up the following questions: How does our magnetic Sun look like as a star? How does a typical solar magnetic cycle appear for ZDI? And is the solar magnetic cycle a typical one?

In my talk, I will address these questions by presenting how ZDI would observe our Sun-as-a-star across a whole solar activity cycle using 3D non-potential flux transport simulations covering 15 years and vector magnetic field observations from the Solar Dynamic Observatory (SDO) of the last 8 years. I will highlight, what are the caveats if we go from high to low resolutions detecting only the large-scale field and how to interpret stellar ZDI maps. Further, I will present the best strategy to identify solar-like magnetic cycles and answer which large-scale magnetic field parameters best follow a solar-type magnetic cycle before I compare our Sun-as-a-star magnetic cycle with the magnetic cycles we observed for other stars so far.