

**Title:** Understanding Solar Activity During the Last 400 Years

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**Abstract:**

The solar cycle modulates the frequency of space weather events, and its long term evolution might be a driver of climate change. Sunspot group numbers are the main source of data for understanding solar long-term variability. However, cross-calibrating historic measurements is difficult due to the presence of large observational gaps. One of the proposed alternatives, the active day fraction, aims to calibrate any observer to a modern day observatory by analyzing the relative frequency of active (at least one sunspot group) and quiet (no visible groups on disk) days. This method works by characterizing the smallest active region any given observer could have observed in comparison with a reference observatory. Finding this observational threshold for an observer allows us to apply a calibration even in the case where there is little to no overlap between other observers. So far we have found that this method works well for many observers, although there are multiple ways to calculate the active day fraction that can significantly affect performance in some cases. In this presentation we will discuss the assumptions that go into the different alternatives and a support vector machine application that we are training to predict which methods works best for an observer, based on its observational properties.