GOLF and BiSON as Proxies for Solar Activity

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GOLF and BiSON use resonant scattering spectrophotometers to provide near-continuous high-precision observation of the solar sodium and potassium Fraunhofer lines around 590 and 790 nm. With BiSON observations covering more than 3 solar cycles and over 15 years of simultaneous GOLF data, we have a unique insight into the recent history of the Sun.

The primary mission of GOLF and BISON is the calibration of observed photon flux into radial velocity in order to detect global solar oscillations. Parameters of solar oscillations are sensitive to the state of the solar activity cycle and hence these parameters can be used as a proxy for solar activity. A secondary consequence of space-based GOLF observation is the sensitivity to surface activity - GOLF reveals solar activity directly in its flux measurements.

Here we demonstrate the dependence and the excellent agreement of GOLF & BiSON measurements of the 11 year solar activity cycle, together with GOLFs sensitivity to individual sun spots. In addition to the well known 11 year periodicity, we find a 2 year cycle possibly linked to a second solar dynamo.

Hence GOLF and BiSON provide excellent proxies for the state of solar activity.

Relevant Astrophysics Deduced from the Solar Oblateness

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The measurement of solar oblateness has a rich history extending well back in the past. Up to recent years, its estimate has been keenly disputed, as well as its temporal dependence. Recent accurate observations of the solar shape allowed raising the doubt, and so far, only satellite experiments, such as on board SDO, seem to achieve the required sensibility to measure the expected faint deviations to sphericity. A shrinking or an expanding shape is ultimately linked to solar activity as even a small variation in solar radius causes variation in gravitational energy. In period of higher activity, the outer photosphere develops a thin cantaloupe skin under the influence of higher gravitational moments. Accurate determination of the shape of the Sun is thus one of the ways we have now for peering into its interior, learning empirically about flows and motions there that would otherwise only be guessed from theoretical considerations, developing more precise ephemerides and ultimately building possible new gravitational theories.