



Reconstruction of gaps in the past history of solar wind parameters

Dmitri Kondrashov (1), Richard Denton (2), Yuri Shprits (3,4), and Howard Singer (5)

(1) University of California, Los Angeles, Department of Atmospheric and Oceanic Sciences, Los Angeles, United States (dkondras@atmos.ucla.edu), (2) Dartmouth College, Department of Physics and Astronomy, Hanover, New Hampshire, USA., (3) University of California, Los Angeles, Department of Earth and Space Sciences, Los Angeles, USA, (4) Skolkovo Institute of Science and Technology, Moscow, Russia., (5) NOAA, Space Weather Prediction Center, Boulder, CO, USA.

The historical (1972-2013) gaps of the solar wind parameters are filled-in by smooth modes of co-variability using the continuous geomagnetic indices with Singular Spectrum Analysis (SSA). A systematic study using experiments with synthetic gaps has been performed to determine optimal SSA parameters for reconstruction of realistic gaps over the full solar cycle, and to assess the reconstruction skill. We also assessed the accuracy of the SSA gap-filling for solar wind reconstruction in T96 and TS05 empirical magnetic field models, and compared it to results based on parameters from existing Qin and Denton interpolation. For T96 and TS05 validation GOES magnetic field measurements were used. The SSA gap-filling method does improve accuracy of empirical magnetic field models, especially when gaps are large. In particular, for the TS05 magnetic field model, the error due to incomplete knowledge of the solar wind parameters was reduced by 30% by using solar wind parameters reconstructed using the SSA method instead of parameters found by Qin and Denton interpolation. Accuracy of reconstructions of solar wind parameters by two methods has been also compared in time domain. SSA provides most improvement over Qin and Denton interpolation in large gaps, while in small gaps performance of both methods is similar.