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Different optimum solar activity proxies for foF2 at middle and low latitudes

Jan Laštovička

Institute of Atmospheric Physics, Czech Acad. Sci., Ionosphere and Aeronomy, Prague 4, Czechia (jla@ufa.cas.cz)

To model ionospheric climate and to study its long-term changes and trends we need solar activity proxies, because long and homogeneous data series of solar ionizing flux are not available. To select the optimum solar activity proxies, we use yearly average foF2 data of eleven ionospheric stations from middle and low/equatorial latitudes of four continents over 1976-2014 and six solar activity proxies, F10.7, sunspot numbers, F30, Mg II, He II and solar Lyman- α flux. For middle latitudes and higher low latitudes down to about 20-24°N, Mg II and F30 are found to be the optimum solar proxies, not the usually used F10.7 or sunspot numbers. At lower and particularly equatorial latitudes the situation is different; the optimum proxy for Jicamarca is sunspot number and He II, and for Vanimo He II. Solar activity describes 99% of the total variance of yearly foF2 at midlatitudes and its dependence on solar proxies is highly linear. Long-term trends in foF2 are found to depend to some extent on solar proxy used