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# Relationship between ionospheric F2-layer Critical Frequency, F10.7, and F10.7P around African EIA trough

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## Abstract

Improved ionospheric modeling requires a better understanding of the relationship between ionospheric parameters and their influencing solar and geomagnetic sources. Published reports of the validation of the International Reference Ionosphere (IRI) for quiet-time revealed either underestimation or overestimation at a greater magnitude during high solar fluxes, especially at low latitude. With daily foF2 data from Ouagadougou (geor. 12.4 $^{o}$N, 1.5 $^{o}$W) covering a solar cycle, we have presented preliminary results from the analysis of solar dependence of six different classifications of the data: (i) daily values, (ii) monthly mean, (iii) daily quiet values (with Ap $\leq$ 20), (iv) monthly-quiet-mean values, (v) monthly median, and (vi) monthly-quiet-median values. All six classifications show good nonlinear relationship with both F10.7 and F10.7P, however, the differences between the dependence of classes (i) and (iii) of foF2 on the two solar indices is more substantial than those of classes (ii), (iv), (v), and (vi). Of all four classes, the monthly averages are best related to both solar activity indices. Further analysis shows that magnetic disturbances are non-influential in the variations of the monthly mean of both solar activity indices; this makes both good indices for quiet-time modeling. Likewise, F10.7 and F10.7P are indistinguishable for long-term modeling around the African EIA trough region. While monthly median values may be best for mid-latitude region, either the mean/median values could be used for low-latitude region. However, it could be worthwhile to examine the distribution of the data from the station under consideration.

**Keywords:** *International Reference Ionosphere (IRI), Equatorial Ionization Anomaly (EIA), Solar Activity Indices, modeling*

## *1 Introduction*

The ionosphere, which is susceptible to changes in solar and geomagnetic sources, as well as ionospheric dynamics, remains the cheapest medium for long distant radio communication. However, communication circuits could be either disrupted on a shorter scale by geomagnetic disturbances, whose frequency and intensity increases with increasing solar activity or on a longer scale by decreased/increased rate of ionization and the effect of other electrodynamics that tracks the solar cycle (Liu et al., 2006). Published results of past investigations have revealed that some remarkable effects of the longer scale disruption of communication circuits are the saturation and amplification effects (Liu et al., 2003, 2006; Liu and Chen, 2009; Ikubanni and Adeniyi, 2013).

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