SRF2 - A short-term (1-24) hour foF2 prediction model.

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SRF2 (SunRise F2-layer) is a new approach to construct local (for a given ionospheric station) empirical prediction models for a short-term (1-24) hour foF2 forecast. All previous attempts to create empirical forecasting models were based on using global indices of solar and geomagnetic activity such as ap, Kp, $F_{10.7}$. However ionospheric F2-layer only on average reflects variations of such global indices while each particular magnetic storm results in its individual pattern which cannot be adequately described with such indices. Moreover there is a class of F2-layer perturbations occurring under quiet magnetic activity (so called Q-disturbances) which are related to day-to-day variations of thermospheric circulation and corresponding changes of the atomic oxygen abundance. Such variations of thermospheric parameters cannot be correctly predicted at present. On the other hand, it is well-known that mid-and low-latitude F2-layer to a great extend manifests the state of surrounding thermosphere. Due to peculiarities of thermospheric circulation main changes of thermospheric composition take place during nighttime hours. Therefore sunrise NmF2 may serve as an indicator of thermospheric neutral composition at a particular station which will determine NmF2 at least for the following daytime-evening hours. This idea was used in the proposed method. Observed during sunrise hours gradient NmF2 plus the last observed foF2 were used in a regression to predict foF2 with (1-24) hour lead time. The method was applied to some mid-latitude stations located in different longitudinal sectors of the Northern Hemisphere and the foF2 prediction accuracy was compared to the IRI(STORM) model. The proposed method manifests much better accuracy compared to IRI(STORM) predicting Q-disturbances (both Negative and Positive) especially in winter. This result is important from practical point of view as there are no methods at present to predict foF2 variations during Q-disturbance events. The method also demonstrates better results compared to IRI(STORM) for severe storm periods but for smaller lead times.