

A new method to retrieve thermospheric parameters from daytime Ne(h) observations in the F1-region

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A new method to retrieve T_{ex} , [O], [O₂], [N₂] as well as the total solar EUV flux with $\lambda < 1050 \text{ \AA}$ from daytime Ne(h) profiles at F1-region heights (160-190) km has been proposed. Unlike the previous version of the method based on foF1 observations and confined by summer months the new one can be used for all seasons of the year. The method was tested with winter CHAMP/STAR neutral gas density observations and DPS-4 Ne(h) profiles in Europe. Depending on testing periods the method manifests the inaccuracy of (11-14)% which is less than modern empirical models MSISE00, JB2008, and DTM13 provide. The obtained inaccuracy coincides with the declared inaccuracy of CHAMP/STAR neutral gas density observations. The opportunities of the new method were demonstrated for the St. Patric storm period of (Mar16-20, 2015). During the main and recovery phases of the storm at a higher latitude station, Moscow ($\Phi=51$) the retrieved decrease in the O/N₂ ratio was by 2.5 times larger than MSISE00 predicted. On the contrary, at a lower latitude station, Rome ($\Phi=42$) the O/N₂ ratio was by ~70% larger than model values. The retrieved variations in thermospheric parameters are reflected in corresponding storm-time variations of foF2. Therefore the proposed method looks as a useful tool for ionosphere-thermosphere investigations.