NEUTRAL HYDROGEN DENSITY PROFILES DERIVED FROM GEOCORONAL IMAGING

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The geocorona is produced when solar Lyman α radiation is resonance scattered by exospheric neutral hydrogen. In this paper the Lyman α column brightness measurements from the Geocorononal Imager (GEO), part of the FUV imaging system onboard the IMAGE satellite, have been used to present an empirical model of the neutral hydrogen density distribution at high altitudes. The variable solar Lyman α flux is obtained from the UARS/SOLSTICE measurements and the scattered solar Lyman α emissions from interplanetary hydrogen is obtained from a model. Assuming that the exosphere at high altitudes ($>3\mathrm{R_E}$) can be considered as an optical thin medium and that the hydrogen density profile can be expressed as a double exponential we show that the Lyman α column brightness can easily be converted to hydrogen density profiles. The hydrogen density distribution in the nightside of the Earth is found to be cylindrical symmetric around the Sun-Earth line with a $\sim$40% increase at $180\mathrm{deg}$ solar zenith angle (compared to $90\mathrm{deg}$) above 6-$7\mathrm{R_E}$. The hydrogen density shows temporal variation which is not controlled by any single solar quantity alone. Our hydrogen density profiles show densities in the upper range of what has been modeled by others. Our results are valid above 3 $\mathrm{R_E}$.