Effect of solar activity on 8446 Å and 7320 Å airglow emissions

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Abstract
The atomic oxygen airglow emission at 8446 Å and 7320 Å occurs at nearly 180 – 220km altitude region. These emissions occur due to solar EUV radiation and are very sensitive to the solar EUV flux. These emissions can provide valuable information about the atomic oxygen density and solar activity. We have developed a comprehensive model to study these emissions with the varying solar activity. These two emissions are studied with the help of the newly introduced Solar Irradiance Platform which gives the absolute values of solar flux for any given date and time. We present the results of modeling done over the present solar cycle, starting from 2001 which was an year of solar maximum. For the sake of modeling a mid latitude station at 35N 45E is chosen and the day of the year is chosen to be 3rd April. The results of intensity are presented as a function of F10.7 flux index. The results show a very strong dependence over this index.

\[ V(Z, \alpha) = V_1(Z, \alpha) + V_2(z, \alpha) \]
कृष्णा एवं सिंह : सीरीय इलेक्ट्रॉन पुंज की गणना Richards & Torr मॉडल द्वारा की गयी है।
अनुप्रस्थ काट Julienne & Davis और George M Lawrence से ली गयी है।
सीरीय EUV पुंज Solar 2000 मॉडल (Tobisa et al. 2000) से ली गयी है।

7320 Å उल्सर्जन मॉडल
परमाणुविद्याको अंकीय ज्ञान के 7320 Å (Rusch et al. 1977) का उल्सर्जन निम्नलिखित क्रियाओं द्वारा होता है।

\[ O^+(2P) \rightarrow O^+(2D, 4S) + h\nu(7320\text{Å}) \]

तापमंडल में \( O^+(2P) \) निम्नलिखित क्रियाओं द्वारा होता है।
1. EUV photons during the twilight on the absorption cross-sections of oxygen.

\[ O + h\nu(\lambda < 666\text{Å}) \rightarrow O^+(2P) \]

2. Dissociative excitation of some oxygen-containing molecules: Lifetimes and Electron Impact cross-sections,

\[ R_1(z) = |O| \int \sigma_\lambda(E,\alpha) \Phi(E,\alpha) dE \]
\[ R_2(z) = |O| \int_{E_{\text{th}}}^{\infty} \frac{\sigma_\lambda(E,\alpha) \Phi(E,\alpha) dE}{E} \]

\[ \frac{O^+(2P) + O}{O^+ + O} \]
\[ \frac{O^+(2P) + N_2}{O^+ + N_2} \]
\[ \frac{O^+(2P) + e^-}{O^+(2D,4S) + e^-} \]

\[ K = 1.89 \times 10^{-7} \text{ (Te/300)}^{1/2} \text{ cm}^3 \text{ sec}^{-1} \]
\[ K = 5.2 \times 10^{-10} \text{ cm}^3 \text{ sec}^{-1} \]
\[ K = 4.8 \times 10^{-10} \text{ cm}^3 \text{ sec}^{-1} \]

\[ V_{7320} = \frac{0.781 A_{2p} [O^+(2P)]}{A_{2p} + K_O [O] + K_{N_2}[N_2] + K_e e} \]

References: