

Effects of solar flare on the dayside Venus ionosphere calculated by one dimension photochemical model

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The effects of long-term solar activity changes such as 11-year cycle and 27-day cycle on the Venus ionosphere have been investigated by a number of researchers using data obtained from some spacecrafts. However, the effects of short-term solar activity changes, particularly the effects of solar flares, are still unknown because there are no simultaneous observations of the Venus ionosphere and solar flares. The past observations of the Earth's ionosphere suggest significant and instantaneous changes of the dayside Venus ionosphere during solar flares.

In order to investigate the variations of the dayside Venus ionosphere during solar flares, we have developed a 1-D photochemical model and empirical solar flux model during a solar flare. The 1-D photochemical model estimates vertical profiles of ions and electrons assuming the neutral atmosphere. The model can also apply to the Martian ionosphere with a neutral model for Mars. Using the 1-D photochemical and solar flare models, we have calculated variations of the dayside Venus ionosphere. Our model results show good agreement with past observations and model calculations. Our calculations indicate that the electron density variations of Venus ionosphere during a solar flare are 15 % at the main peak (130 km) and 127 % at the lower peak (124 km), while 13 % and 140 % in the Martian ionosphere. The variations of the dayside ionospheres of both planets during solar flare show similar tendency: the more variable in the lower altitude region. However, variations of Martian ionosphere at the lower peak are larger than Venus. Atomic O mixing ratio is one of the factors which produce the difference.