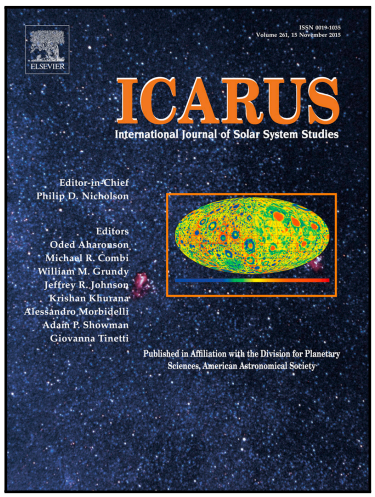

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Highlights

- **Mode 1 aerosol consists of $FeCl_3$ in the middle and lower clouds**
- **Loss of $FeCl_3$ by coagulation with sulfuric acid**
- **Iron chloride fractions are 17 and 19 ppbv in the atmosphere and rocks**

Abstract

Iron chloride in the Venus clouds is under discussion for three decades, and the saturated vapor pressure of this species is of crucial importance for its modeling. There is a great scatter in the published data, and the preferable results are by Rustad and Gregory (1983, J. Chem. Eng. Data 28, 151-155) and those based on thermodynamic parameters by Chase (1998, J. Phys. Chem. Ref. Data Monograph 9). Using these data, loss by coagulation with sulfuric acid, transport by eddy diffusion, and the Stokes precipitation, the model confirms conclusions of our early study (Krasnopolsky 1985, Planet. Space Sci. 33, 109-117) that $FeCl_3$ in the Venus clouds (1) agrees with the near UV and blue reflectivity of Venus (Zasova et al. 1981, Adv. Space Res. 1, #9, 13-16), (2) was observed by the direct X-ray fluorescent spectroscopy, (3) explains the altitude profiles of the mode 1 aerosol in the middle and lower cloud layers and (4) the decrease in the NUV absorption below 60 km. Here we add to these conclusions that (5) the delivery of $FeCl_3$ into the upper cloud layer and the production of sulfuric acid are just in proportion of 1 : 100 by mass that is required to fit the observed NUV albedo. Furthermore, (6) the mode 1 and 2 particle sizes fit this proportion as well. Finally, (7) the required Fe_2Cl_6 mixing ratio is 17 ppbv in the atmosphere and the $FeCl_3$ mole fraction is 19 ppbv in the Venus surface rocks.

Keywords

Atmospheres, composition; Venus; Venus, atmosphere

1. Introduction

Zasova et al. (1981, see also Krasnopolsky (1986, 2006)) argued that the blue and near ultraviolet absorption in the upper clouds of Venus can be caused by iron chloride $FeCl_3$ diluted in the sulfuric acid droplets with concentration of ~1% (Figure 1). Absorption spectra of some other species were calculated as well. According to the figure, sulfur aerosol, chlorine, and nitric dioxide may contribute but cannot explain the NUV absorption. Furthermore, photochemical