Evidence for SO_2 condensation on the nightside of Io

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The surface of 10 is bel ieved to cons i st primari 1 y of el emental sul fur al 1 otropes and SO_2. The exact nature of these materials, their puri ty, thei r fractional surf ace coverage, and thei r interaction wi th a possibl e SO_2 atmosphere are Sti.11 uncertain.

During the Voyager 2 encounter about 10 sequences of the dark (Jupi ter - i l luminated) side of Io were obtained. Because i t is not possible to obtain such observati ons from Earth, these images represent a uni que opportuni ty for understanding several probl ems rel ating to the surface composi tion of 10. One i report ant probl em is the questi on of condensation of SO_2 f ros t on the ni ght s i de of 10. According to standard vapor pressure curves (Matson and Nash, 1.983), the vapor pressure of SO_2 drops more than 10 orders of magnitude between day and ni ght temperatures on Io, which differ by 70K. The exi stence or absence of SO_2 condensates on the night s i de is thus a sens itive i ndicator of an SO_2 atmosphere. Veverka et al. (1981) fai led to observe pose-cclipsc brightening as Io emerged from Jupiter's shadow. And a recent analysis by Simonelli et al. (1994) didn't show any local bri ghtenings on the dark side in the Voyager vi 01 ct. f i lter, which is sensiti ve to the presence of SO_2 f rost.

Our analys is applies a new approach to· thi s probl em. in.stead of searching for albedo changes, we search for col or changes on the dark side of I o. Because SO_2 f I-es t. isbluer than elemental sul fur in the UV-vi o] cL. porti on of the spectrum, the nightsi de of Io shoul d be bluer than the daysi de i f SO_2 frost is condens i t ıg on i t.. A col or mosaic of the dark side of 10, created from ul travi o] et and green i mages from tl ıe Voyager 2 spacecraft, shows that in fact. the darksi de of] o is bl uer than the same regi on under sol ar i] lumi nati on. Thi s resul t; provi des evi dence for the gl obal condensati on of SO_2 f rost on the dark hemi sphere of 10. Perf ormed under contra ct to NASA,

Matson, D. and Nash, D. (1983) J .G. R. 88, 4771.
Simonell i , D. et al . (1994) Icarus , in press.
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