Geophysical Research Abstracts
Vol. 16, EGU2014-6258, 2014
EGU General Assembly 2014

Detectability of fluorescence emission signatures from 67 P/Churyumov-Gerasimenko using VIRTIS-H aboard Rosetta

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We present a very simple model to obtain a first order estimate of the detectability of parent molecules from 67/P Churyumov-Gerasimenko, from their fluorescence signatures between 2 and 5 micrometres, using VIRTIS-H aboard Rosetta. For molecules other than H_2O, CO and CO_2, no complete calculation (including collisions and dust effects) has been published so far, so a first order analysis is pertinent. We consider the optically thin case, with solar fluorescence as the only emission mechanism. As a first approximation, the rotational populations in the fundamental vibration mode are assumed to follow a Boltzmann distribution at low temperature. Production rates of H_2O, CO and CO_2 are taken from the Rosetta Project Comet Reference Model (ESA, 30 March 2012). For other molecules, estimates are taken or extrapolated from Bockelee-Morvan et al, Comet II, 2005. Our results will be compared with the predictions for H_2O, CO and CO_2 obtained from more elaborated models (Debout et al. DPS#45, 413.02, 2013). At 3 AU, the first molecule expected to be detectable is CO_2, followed by H_2O. We will present detectability limits for several parent molecules (CO, OCS, CH4, CH3OH, H2CO, NH3, SO_2 and H2S), at 3 AU and at perihelion.