

Commitment to European Mars Missions ~ via Infrared Spectroscopic Sciences ~

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In this paper, we introduce our past, current, and future activities connecting the European Mars missions via infrared spectroscopic sciences, which can potentially be shared with any scientists who have interests to Martian atmospheric sciences.

Even after the unfortunate end of Nozomi mission in 2014, we tried to continue the researches of Mars via several methods. As one of such activities, from 2008 we started the collaboration with Italian Planetary Fourier Spectrometer team aboard Mars Express (PI: Vittorio Formisano and Marco Giuranna. Shohei Aoki was moved to this institute from Nov. 2014.). We did the commitment to the science field related to Martian Methane (searches of SO₂ for the gas production from the crust and H₂O₂ for oxidization loss), H₂O & Aerosols (searches of HDO/H₂O ratio for water cycle and CO₂ cloud for gravity waves), and local time variations (searches of thermal tides for planetary waves and dust for daily variations), with the contribution to the calibrations and retrievals. Based on these activities, we did the discussion for the Proposal of infrared spectrometer from Russian (Oleg Korablev) & French (Franck Montmessin) team to our Martian orbiter project based on VEX/SOIR.

Possible collaboration with ESA ExoMars Trace Gas Orbiter mission is based on this heritage. NOMAD and ACS are infrared spectrometer with Echelle, which enables first high spectral-resolution on the orbit on Mars. It can for the first time provide the amount and variation of critical major & minor gas elements, which should be the baseline of next Martian investigations especially in the vertical profile resolution. We will try to extend our current studies related to (1) Global dynamics: GCM/Thermal Tides etc. (now: by MEX/PFS, TGO: TIRVIM), Gravity Waves etc. at Earth/Venus/Jupiter (now: by VEXRadio-Sci., ISS/AirGlow (Earth), IRTF (Jupiter), TGO: all instruments with limb observations in vertical profiles), Mesospheric wind (now & TGO: by groundbased MIR/mm/submm + Models), and (2) Water & CO₂ Cycles: H₂O & CO₂ clouds (now: by MEX/PFS & OMEGA, TGO: TIRVIM in vertical profile), minor trace gases as H₂O/HDO, ¹²CO₂/¹³CO₂, H₂O₂, CH₄, etc. (now: by groundbased NIR/submm, MEX/PFS, TGO: NIR/MIR/TIRVIM) as the complete exploration, with with modeling studies & the development of Radiation-Transfer code.

Related to this project, we also commit to EU Project CROSS DRIVE (Collaborative Rover Operations and Satellites Science in Distributed Remote and Interactive Virtual Environments). It aims the exploitation of produced huge datasets of potential immense value for research as well as planning and operating ESA ExoMars 2016 (TGO) and 2018 (Rover) missions. We provide 'Ground-based Mars Data / CRISM data' as the test platform for the comparison with other Mars missions outside of ESA (orbiters & landers) and ground-based telescopes (from the Earth & on its orbit) from outside of PDS, PSA, etc., with IAPS/INAF colleagues.

We welcome any contributions from any scientists who have interests to Martian atmospheric sciences in Japan.