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Possible atmospheric science objectives for the MarsNEXT mission

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Compared to the Earth, one key characteristic of the Mars atmosphere is the vertical extent of most of the meteorological phenomena. On Earth, the stratosphere confines the Hadley cell and most of the planetary waves to the troposphere, below 20 km. On Mars there is no similar effect and many structures extend vertically up to the thermosphere (120 km). Monitoring the global atmosphere from the surface up to thermospheric levels is thus of key importance since the physical states, and therefore also the chemical compositions, of the different layers are strongly coupled with each other. Ultimately, the escape fluxes of the different species at the top of the atmosphere are controlled by the chemical composition of the thermosphere and the surrounding exosphere, their vertical structure and the dynamics of the solar wind-atmosphere boundary layers. Over long time scales, outgassing plays also a major role in the history of volatiles and climate, and interior-atmosphere interactions are therefore of crucial importance in driving atmospheric evolution. The Mars surface-atmosphere-Sun system must therefore be studied as a whole for an in-depth understanding of Martian meteorology and climate.

The MarsNEXT mission, combining in-situ measurements at the surface from a network of stations, remote sensing monitoring of the low and middle atmosphere from an orbiter, and in-situ measurements of the high atmosphere and solar wind interaction regions from a low periapsis orbiter, is ideally suited for simultaneous and co-localized measurements of all atmospheric layers.

The main possible atmospheric scientific objectives of the MarsNEXT mission in the field of meteorology (dynamics of the global low-middle-upper atmosphere), chem-

istry (oxidation processes and atmospheric chemical cycles), climate (water, carbon dioxide and dust cycles,) and evolution (present escape and outgassing processes) are presented.