Introduction: ESA’s Mars Express (MEX) spacecraft has operated in Mars orbit since 2004. On-board MEX, the ASPERA-3 (Analyser of Space Plasma and Energetic Atoms) instrument is providing a unique dataset of the space plasma near Mars for more than 15 years, covering a complete solar cycle, allowing long-term investigation of the interaction of Mars with the solar wind. The large number of observations also enables unique statistical studies. The effort of the ASPERA-3 development is highly international, involving 15 research groups from Europe, USA and Japan [1], with a user base that is even more extended. More than 200 publications have been published based on ASPERA-3 data.

ASPERA-3: The ASPERA-3 instrument comprises five sensors: three energetic neutral atom (ENA) sensors, an electron spectrometer and an ion mass spectrometer, as shown in Fig. 1. This project concerns the Ion Mass Analyzer (IMA), which provides ion measurements in the energy range 0.01-30 keV/q for the main ion components H+, H2+, He+, O+, the group of molecular ions (20-80 amu/q) and up to 106 amu/q. It covers 90° elevation angle and 360° azimuthal angle, while a part of the field of view is blocked by the spacecraft structure.

Higher Level Datasets: Here we present two higher level data sets that will be available through the ESA’s Planetary Science Archive (PSA) [2].

Solar Wind Ion Moments: The upstream solar wind environment at Mars influence many processes in the planet’s upper atmospheres and induced magnetospheres. To facilitate studies of such processes and general heliophysics, we have developed a database of official solar wind moments (density, velocity, temperature). This dataset can be of interest in any study of space weather at Mars, and its effects on, e.g., Mars upper atmosphere and the near Mars space environment. See Fig. 2 for an example.

Status. ASPERA-3 IMA solar wind moments were delivered to PSA in 2018 and will soon be available [2]. Until then, the data is available on request from the PI (matsh@irf.se).

Figure 2. Solar wind density-velocity distribution at Mars based on data collected by ASPERA-3/IMA. The mean density and velocity here is 2 cm-3, and 400 km/s, respectively.

Ion Differential Flux and Moments: At present raw count rates are archived at PSA for IMA, leaving it up to the individual scientist to convert this into physical fluxes of ions. To simplify scientific investigations using IMA ion fluxes, and to establish one official data set, we will produce and archive ion differential flux and moments, separated by ion specie.

Status. The project to produce ASPERA-3 IMA ion differential fluxes and moments is ongoing. We expect that they will be available on the PSA in 2020.

Acknowledgements: This project is conducted under a contract between the Swedish Institute of Space Physics (IRF) and ESA/ESTEC (No. 4000115355). We appreciate the efforts of PSA at ESA to make the ASPERA-3 datasets public. The Swedish contribution to the ASPERA-3 experiment is funded by the Swedish National Space Agency (SNSA).