AEROSOL RETRIEVALS FROM MEDA RDS. D. Toledo[1], V. Apéstigue[2], I. Arruego[1], M. D. Smith[3], M. Lemmon[4], M. Yela[1], J.J. Jiménez[1], E. Garcia[1], L. Gomez[1], D. Viúdez-Moreiras[1], A. Saiz-Lopez[5], A. Sánchez-Lavega[6], S. Pérez-Hoyos[6], M. de la Torre Juarez[7] and J.A. Rodríguez Manfredi[1,5], [1]Instituto Nacional de Técnica Aeroespacial (INTA), Spain, [2]ISDEFE, as external consultor at INTA, Spain, [3]Goddard Space Flight Center NASA, USA, [4]Space Science Institute, College Station, USA, [5]Consejo Superior de Investigaciones Científicas (CSIC), Spain, [6]Universidad del País Vasco UPV/EHU, Spain, [7]Jet Propulsion Laboratory (JPL), USA.

On Mars, dust and clouds are primary elements for studying the interactions of solar radiation with atmosphere and the surface. Depending on the number density, particle radius and refractive index, airborne dust can provide positive or negative radiative feedbacks into the dynamical processes. In addition, the dust particles can act as ice nuclei for the formation of clouds, that in turns influence the vertical distribution of dust by cloud scavenging. Thus, these processes set up a number of complex feedbacks, and point the need of characterizing simultaneously the properties of dust and clouds at different time periods and locations.

To address these measurements, the Radiation and Dust Sensor (RDS) [1] is part of the Mars Environmental Dynamics Analyzer (MEDA) [2] payload onboard of the Mars 2020 rover Perseverance. RDS instrument compromises two sets of 8 photodiodes (RDS-DP) and a camera (RDS-SkyCam). One set of photodiodes is pointed upward, with each one covering a different wavelength range between 190-1200 nm. The other set is pointed sideways, 20 degrees above the horizon, and they are spaced 45 degrees apart in azimuth to sample all directions at a single wavelength. Skycam is an upward-looking fisheye camera in the RDS housing [3]. It includes a neutral density (ND) annulus--twice each sol when the Sun transits the ND, solar flux can be measured with an image, allowing a simple extinction optical depth retrieval [4]. The analysis of RDS observations with radiative transfer simulations will allow us to: i) determine the number density, size distribution and refractive index of dust particles; ii) detect and characterize clouds during twilight; and iii) detect dust lifting events near the surface such as dust-devils.

To study the performance of the instrument and the retrieval procedure [5], RDS terrestrial prototype participated in a field campaign in Huelva (Spain), a region characterized by frequent Saharan dust instructions. In this presentation we will discuss the results obtained in this campaign for which RDS-DP retrievals were compared against an AERONET photometer (localized at the same location). Figure 1 shows, as example, a comparison between the dust optical depth estimated by both instruments. We will also discuss the possible synergies between RDS-DP and RDS-SkyCam [2] on Mars for dust and cloud characterization (e.g. optical depth, particle radius, vertical distribution).

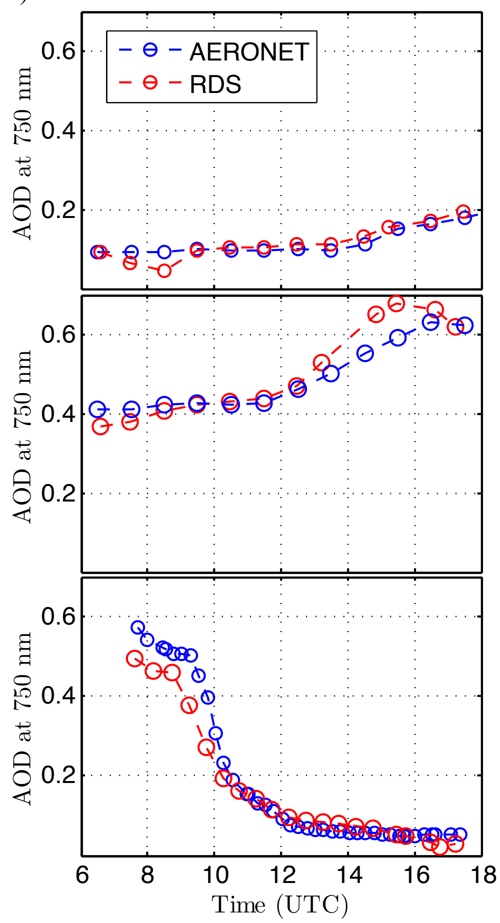

Figure 1. Dust optical depth derived from RDS observations and AERONET at 750 nm for the 3-days campaign period.

References: [1] Apéstigue et al., (2015) EPSC, Nantes (France). [2] Rodriguez-Manfredi et al., special Mars2020 issue on SSR. [3] Lemmon et al., (2019) LPSC. [4] Lemmon et al., (2015), Icarus 251:96. [5] Toledo et al., (2017), Planetary and Space Science 138 33–43.