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Evolution of stream interaction regions from 1 to 1.5 AU

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We inspect the evolution of stream interaction regions from Earth to Mars for the declining solar cycle 24. In particular, the opposition phases of the two planets are analyzed in more detail. So far, there is no study comparing the long-term properties of stream interaction regions and accompanying high-speed streams at both planets for the same time period. We build a catalogue covering a dataset of all measured stream interaction regions at Earth and Mars for the time period December 2014 – November 2018. The number of events (>120) allows for a strong statistical basis. To build the catalogue we use near-earth OMNI data as well as measurements from the Mars Atmosphere and Volatile EvolutioN (MAVEN) spacecraft. For the opposition phase, we additionally use image data from the Solar Dynamics Observatory to complement the in-situ observations. Bulk speed, proton density, temperature, magnetic field magnitude and total perpendicular pressure are statistically evaluated using a superposed epoch analysis. For the opposition phase, coronal holes that are linked to individual streams are identified. The extracted coronal hole areas (using CATCH) and their longitudinal/latitudinal extension are correlated to the duration and maximum bulk speed of the high-speed stream following the passage of a stream interaction region. We find that an expansion of the stream interface from 1 to 1.5 AU is most visible in magnetic field and total perpendicular pressure. The duration of the high-speed stream does not increase significantly from Earth to Mars, however, the stream crest seems to increase. The amplitudes of the SW parameters are found to only slightly increase or stagnate from 1 – 1.5 AU. We arrive at similar correlation coefficients for both planets with the properties of the related coronal holes. There is a stronger linking of maximum bulk speed to latitudinal extent of the coronal hole than to the longitudinal. On average, the occurrence rate of fast forward shocks increases from Earth to Mars.