Multi-spacecraft signatures of the merging of two coronal mass ejections during propagation

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Coronal mass ejections (CME) interact with their surroundings during lift off in the corona as well as during their propagation in the interplanetary medium. CMEs may also interact with other CMEs if they are released in sequence, and closely separated in space and time. Scenarios where the interaction leads to the merging of sequential CMEs have been modelled using global simulations, but direct observation of this merging from two vantage points at different distances has not been reported so far. We present observations from Solar Orbiter, Bepi-Colombo, STEREO-A and L1 spacecraft in radial alignments at separate longitudes that permit to study such interactions. Although the CMEs at both longitudes look alike, analysis suggests they are different CMEs. A focus on measurements along the Solar Orbiter – Earth line shows signatures consistent with the merging of two CMEs. While two apparently distinct CMEs, with a sheath compression region in between, are observed at Solar Orbiter closer to the Sun (at 0.45 AU), only an apparent single CME is observed near Earth at L1. Analysis suggests that the CME at L1 may be made of two CMEs after merging. In particular, flux ropes magnetic fluxes and orientations, suprathermal electron properties and signatures of magnetic reconnection at both locations are consistent with this scenario.