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Diurnal Cycle and Variability for Northern Winter Wind Patterns at Elysium Planitia as Observed by the NASA's Insight Mission

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NASA's InSight mission landed in Elysium Planitia (∼4.5ºN, 136ºE) on November 2018 at Ls ∼298°. It carries, among other instruments, the APSS (Auxiliary Payload Sensor Suite) that includes the TWINS (Temperature and Winds Sensor) package [1, 2], heritage from the previous sensors sent to Mars as part of the Mars Science Laboratory (MSL). This will allow surface wind patterns to be measured at InSight's landing site, and - given its proximity to MSL's location in Gale Crater - will complement the diurnal and seasonal wind characterization already performed using data from MSL's Rover Environmental Monitoring Station (REMS) wind sensor [3, 4]. The latter is of particular interest given the damage the REMS wind sensor suffered during MSL's landing, resulting in little reliable wind data available for the northern winter season, which prevents a full understanding of the seasonal wind patterns in Gale Crater, and especially of the interaction between local, regional and large-scale circulations.

A large set of wind data have already been obtained from the InSight wind sensor, enabling the diurnal cycle of wind speed and direction in local winter to be determined for the landing site in Elysium Planitia. The wind patterns are expected to show significant sol-to-sol variability and a complex diurnal cycle, although not as complex as seen in Gale Crater [3,4]. The observed wind patterns are dominated by the large-scale Hadley circulation in this season, but also affected by the regional upslope and downslope winds, which shape the diurnal behavior [1]. Comparisons of InSight data with data acquired at the MSL site aid in interpreting how the large-scale, regional and local circulations interact to lead to the diurnal cycle of winds observed at each site, also improving circulation model predictions for both regions. A complementary work related to a detailed description of how using data from different sources, such as MSL and Insight, help to constrain models of the more general region, will be presented in [5].

[1] Spiga, A. et al. (2018) SSR, 214:109. [2] Banfield, D. et al. (2019) SSR, 215:4. [3] Viúdez-Moreiras, et al. (2019), G. Icarus, 319, 909-925. [4] Viúdez-Moreiras, D. (2019). Icarus, 319, 645-656. [5] Newman, C.E. et al. (2019), EGU.