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Planet Four: Probing Seasonal Winds on Mars by Mapping the Southern Polar CO_2 Jet Deposits

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South polar regions of Mars show extensive spring activity every year. The polar regions have been routinely monitored by HiRISE for the last 6 Martian years with the aim, among others, to understand how the surface and atmosphere are influencing each other. The seasonal activity in spring stems from differential sublimation of the seasonal CO_2 ice layer and culminates in cold CO_2 jets that erupt at multiple locations. The jets are known to modify the surface and interact with the atmosphere. They lift dust and sand particles into the lower atmosphere while near-surface winds transport the airborne particles, which fall back to the surface in fan-shaped deposits. We posted HiRISE observations in the Citizen Science Project Planet Four (http://www.planetfour.org) where volunteers were asked to mark seasonal fan deposits in the images presented to them. The reduction pipeline was implemented to create a catalog of fan objects from the Planet Four markings. The pipeline includes 5 stages: cleanup, clustering, combination, thresholding, and ground projection. Using this pipeline, we created a catalog of all the resulting markings of fans, which includes fan coordinates, orientation and spreading angles. We will present results on wind directions inferred from the Planet Four data. We focus on four example regions of interest (ROIs) during two martian years (MY29 and MY30) to showcase the use of the Planet Four data catalog and our ability to monitor wind directions using fan markings positions and locations. For the considered sub-set of data, volunteers made over 2.7 million fan classifications which after the reduction pipeline resulted in a combined 159,288 fans. In ROIs Ithaca, Giza, and Manhattan the derived mean winds show no significant inter-annual variability between MY29 and MY30: at comparable L_s their directions are the same with less than 10 degree variations. The wind direction slowly shifts east-word during spring, albeit with different rates. In Inca City the mean direction of fans coincides with the direction of slopes and changes over spring when more slopes become exposed to sunlight and cold jet eruptions happen. In summary, Planet Four is a tool that provides the rare opportunity to receive rare information about winds on Mars during the most active season at the very active and volatile locations. This information is valuable for further understanding of the Martian atmosphere and its interaction with the polar regions.