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Observation and Assessment of Seasonal Change, Cavi Angusti, Mars

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Due to the orbit geometry of Mars-orbiting spacecraft, the polar areas of Mars have been receiving significant attention since the 1970s, in particular when it comes to observations from orbital camera systems. The polar areas also exhibit most prominent seasonal – and even longer-term – changes due to cyclic processes related to water ice and carbon-dioxide ice. Their geomorphic relevance can be traced in a plethora of surface features ranging from aeolian landforms, to cold–climate processes related to sublimation and deposition cycles of water and carbon dioxide on different geometric and temporal scales.

A recent assessment of the spacecraft observation density at the South Pole of Mars revealed a dense coverage pattern with tens to even hundreds of image observations per degree bin by MEx HRSC, MO THEMIS, MGS MOC and MRO CTX. Due to illumination conditions, observations are mainly between southern spring and early autumn corresponding to a solar–longitude range of roughly 190°–320°. This allows us to construct seasonal maps and to identify spots of high–density coverage in order to investigate evolution of geomorphic features within their environmental and temporal framework.

We here report on a systematic seasonal survey across the Cavi Angusti area at the rim of the south polar cap. It exhibits a variety of classcial polar features at different scales and shows pronounced seasonal change patterns associated with deposition and sublimation but also with changes in the thermal regime of the uppermost layers. The high-resolution survey also allows tracing polar layers and provides insight into the structural composition of the area.

Given the prominence of this region and associated high-density image coverage we can in particular reconstruct the process of thermal contraction cracking in narrow intervals and by limiting observational blanks to periods of darkness which substantially improves the understanding of polar polygon formation.