Polarization imaging of comets at geocentric distances smaller than 0.5 au: Comet 73P/Schwassmann-Wachmann 3

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Remote observations of sunlight scattered by solid particles provide information on the particle properties for a large variety of comets. When comets approach the Sun, solid particles and gases are released from the surface or from the inner layers [1,2]. If the comet is close enough to the Earth, the inner coma may be studied. Different coma regions are observed corresponding to different dust properties, e.g., in jets or fresh ejected dust around the coma. Narrow-band continuum filters or broader-band filters in less contaminated spectral domains (red or near infrared) are currently used to avoid or reduce the contributions from gaseous emission.

Comet 73P/Schwassmann-Wachmann 3 is a fascinating fragmenting comet. Different observations in 1995 revealed an increase of activity and at least four fragments of the nucleus. In its 2011 apparition, the fragments were well separated and appeared like small individual comets. In 2006, its apparition was very favorable and allowed high- spatial resolution imaging by different complementary techniques. We observed three fragments of comet 73P/Schwassmann-Wachmann 3 from April 27 to May 3, 2006, by imaging polarimetry with the 80-cm telescope at Observatoire de Haute-Provence. The distance to the Earth was smaller than 0.2 au. Fragment C resembles a classical active comet. Regions of high and lower polarization were observed in the inner coma, appearing to change almost periodically. The variation of polarization in the inner coma was important from one night to the next one, the whole coma polarization being about constant for nucleus distances greater than 2000 km and increasing with the phase angle. Fragment B continued its (sequential) fragmentation, with a region of secondary fragments progressively moving away from the main nucleus in the antisolar direction. The chemical composition has been reported as being similar in all the fragments [3], but differences were observed between them in polarization underlining differences in, e.g., structure or size distribution of the particles during their ejection and fragmentation. The variation of polarization in the coma and around the fragments will be presented. Finally, a comparison to other comets, including split comets observed at small geocentric distances, will be provided.

Acknowledgements: We acknowledge Programme National de Planetologie (PNP) for funding the observations.

References: [1] Hadamcik et al., Icarus 190, 459-468 (2007). [2] Hadamcik et al., A&A 517, A86 (2010). [3] Dello Russo et al., Nature 448, issue 7150, 172-175 (2007).