Water, hydrogen cyanide, and dust production from the distant comet 29P/Scwassmann-Wachmann 1

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Comet 29P/Schwassmann-Wachmann is a periodic comet, also classified as a Centaur, orbiting on a nearly circular orbit at 6 au from the Sun. It is well known for its permanent activity driven by CO outgassing, and its episodic outbursts.

Comet 29P was observed in 2010–2011 with the Herschel space observatory. Observations of water and ammonia were performed with the Heterodyne Instrument for the Far-Infrared (HIFI). One set of measurements was obtained two days after a major outburst (16 Apr. 2010). Images of the dust coma at 70 and 160 µm were obtained using the Photodetector Array Camera and Spectrometer (PACS). To support these observations, observations of CO and HCN were undertaken at the 30-m telescope of the Institut de radioastronomie millimétrique (IRAM).

We present an overview of this set of observations. H_2O and CO are detected. We also obtain the first detection of HCN in this distant comet. Relative abundances are similar to those measured in the coma of comet C/1995 O1 (Hale-Bopp) when at $r_h = 6$ au from the Sun, but strongly differ from coma compositions at $r_h = 1$ au. The line profiles show evidence that both H_2O, HCN are released from long-lived icy grains. Detailed modeling of water production from icy-grain suggests continuous release of icy grains from the nucleus.

The thermal emission from the nucleus is detected in the PACS 70 µm images. The thermal emission from dust grains is analyzed with a thermal model of dust emission, which takes into account the dust size distribution. Both the size index and the dust production rate are measured.