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- ▣ [Contents of Issue 1](#)
- ▣ [Special Issue](#)

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Technical Note: Evaporation of polar stratospheric cloud particles, in situ, in a heated inlet

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Abstract. In December 2001 and 2002 in situ aerosol measurements were made from balloon-borne platforms within polar stratospheric clouds (PSC) which contained particles of supercooled ternary solution (STS), nitric acid trihydrate (NAT) and ice. Particle size and number concentrations were measured with two optical particle counters. One of these included an ~80cm inlet heated to K to evaporate the PSC particles and thus to obtain measurements, within PSCs, of the size distribution of the particles upon which the PSCs condensed. These measurements are compared to models, described here, that calculate the evaporation of PSC particles at and for an inlet transition time of about 0.1s. The modeled evaporation for STS agrees well with the measurements. For NAT the modeled evaporation is less than the evaporation measured. The primary uncertainty concerns the phase and morphology of NAT particles as they are brought to temperatures >50K above equilibrium temperatures for NAT at stratospheric partial pressures. The slow evaporation of NAT in heated inlets could be used to identify a small NAT component within a mixed phase PSC dominated by STS.

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