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## Refinements in the use of equivalent latitude for assimilating sporadic inhomogeneous stratospheric tracer observations, 2: Precise altitude-resolved information about transport of Pinatubo aerosol to very high latitude

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**Abstract.** From high latitude lidar observations, quite precise information is extracted about the temporal evolution and vertical distribution of volcanic aerosol in the high latitude lower stratosphere following the eruption of Mount Pinatubo. Irreversible mixing of lower stratospheric aerosol, to the arctic pole during early 1992, is demonstrated, as a function of potential temperature and time. This work complements previous studies, which either identify vortex intrusions - without demonstrating irreversible transport, or use lower resolution satellite observations. The observed transport is associated tentatively with the vortex disturbance during late January, 1992. A very large number of high resolution lidar observations of Mount Pinatubo aerosol are analysed, without any data averaging. Averaging in measurement or analysis can cause tracer mixing to be overestimated. Averaging in the analysis can also require assumptions about which quantity has the dominant error (in this case, the equivalent latitude coordinate or the measurement), and which part of the data contains real structure. The method below attempts to avoid such assumptions.

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