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Discovery of cyclone induced East-Asian pollution transport to the lower stratosphere by airborne measurements of Fukushima Xe-133 and SO_2: Potential implications for aerosol and climate

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We report on a novel and decisive experiment to investigate cyclone induced transport of East-Asian polluted planetary boundary layer air to the lower stratosphere. After the Fukushima nuclear power plant complex accident (12-16 March 2011) we have carried out airborne measurements of Fukushima Xe-133, SO_2, and other anthropogenic pollutants. The measurements took place over Europe at altitudes up to 12 km. Xe-133 served as an ideal tracer with a well defined lifetime (half-live: 5.25 days) and a well defined release point. In addition we have conducted detailed air mass transport model simulations. Shortly after the accident, the Fukushima plume was lifted by a warm conveyor belt associated with cyclone. Already on 23 March, our first airborne mission detected the Fukushima plume in the lower stratosphere und upper troposphere above Central-Europe. On 14 April our second airborne mission still detected the substantially aged and diluted plume, which now covered most of the Northern-Hemisphere. Since mid-latitude East-Asia represents an important and still growing source of fossil fuel combustion generated SO_2, our findings have potentially important implications for UTLS aerosol formation and eventually even for climate and the climate-engineering controversy.