

EGU23-9161, updated on 27 Apr 2024

<https://doi.org/10.5194/egusphere-egu23-9161>

EGU General Assembly 2023

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## Organic, inorganic and total bromine observations around the extratropical tropopause and lowermost stratosphere

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Organic, inorganic and total bromine ( $\text{Br}^{\text{tot}}$ ) around the upper troposphere and lower stratosphere (UTLS) were measured over southern Argentina and the surrounding regions extending down to the Antarctic Peninsula in September and November of 2019. These observations were recorded from the German High Altitude and Long range research aircraft (HALO) as part of the Transport and Composition of the Southern Hemisphere UTLS (SouthTRAC) research campaign. Total bromine ( $\text{Br}^{\text{tot}}$ ) is inferred from measured total organic bromine ( $\text{Br}^{\text{org}}$ ) added to inorganic bromine ( $\text{Br}_y^{\text{inorg}}$ ).  $\text{Br}^{\text{org}}$  is comprised of the bromine summed from  $\text{CH}_3\text{Br}$ , the halons, and the major very short-lived brominated species measured onboard HALO by the University of Frankfurt, while the  $\text{Br}_y^{\text{inorg}}$  is evaluated from limb measured BrO and CLaMS photochemical transport modelling (FZ Jülich) accounting for the  $\text{BrO}/\text{Br}_y^{\text{inorg}}$  ratio. Air mass transport pathways into the UTLS and the likely origins of bromine-rich air masses reaching the Southern Hemisphere (SH) lower stratosphere are identified through distributions of in situ measured transport ( $\text{CO}$  and  $\text{N}_2\text{O}$ ) and air mass lag-time ( $\text{SF}_6$ ) tracers as well as Lagrangian transport modelling. Additionally,  $\text{Br}^{\text{tot}}$  measured in the SH is compared with previous measurements observed in the Northern Hemisphere as part of the Wave-driven Isentropic Exchange (WISE) research campaign in fall 2017, as well as the long term trend in stratospheric bromine.