

# SEMINAR NOTICE

*Department of Physics and Engineering Physics  
University of Saskatchewan*

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**SPEAKER:** Matthew Toohey, Institute of Space and Atmospheric Studies  
Department of Physics and Engineering Physics

**TOPIC:** *How long does stuff stay in the stratosphere? Recent progress on an age-old question.*

**DATE:** Tuesday September 15<sup>th</sup>, 2026

**TIME:** 3:30-4:30 p.m.

**Room:** Phys 103

The time that material spends in the stratosphere is a key consideration to understanding the cumulative environmental impact of things like high-altitude aircraft exhaust, space debris, volcanic eruptions and hypothetical solar radiation management schemes. Volcanic eruptions which inject large amounts of gases to the stratosphere constitute natural “pulse injection” experiments, which can be used to estimate the mean lifetime or residence time of stratospheric aerosols, which is controlled by both the aerosol’s gravitational settling and the stratospheric circulation. The lifetime of aerosol from major tropical eruptions like that of Mt. Pinatubo in 1991 has generally been thought to be around 12 months. Using satellite observations and simple conceptual models, I show that the lifetime is around 22 months for Pinatubo aerosol, since it must account for the “lag” between injection and the initiation of removal. Using passive tracer experiments, I show how the residence time of air (an important component of the aerosol lifetime) varies strongly with injection latitude and altitude. Observations of water vapour anomalies from the Hunga Tonga eruption of 2022 show strong qualitative agreement with the passive tracer simulations, corroborating gas residence times of over 4 years for tropical stratospheric injections.