IRREVERSIBLE CLIMATE CHANGE RESEARCH CENTER

Diverse Arctic Oscillation responses after volcanic eruptions at different latitudes during the last millennium

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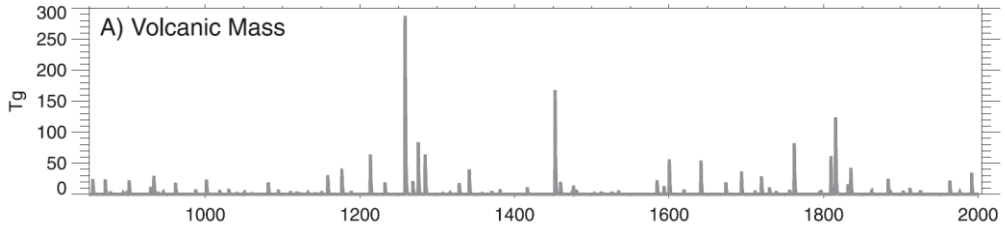
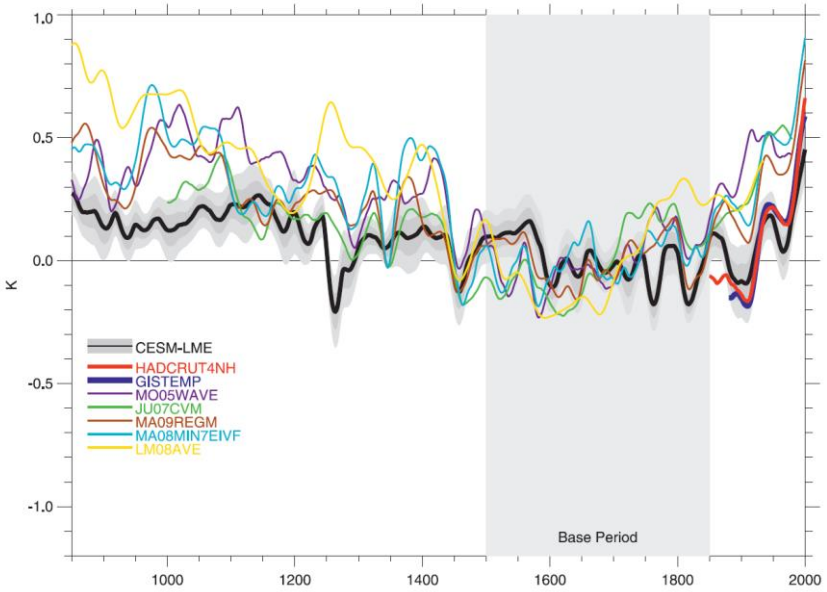
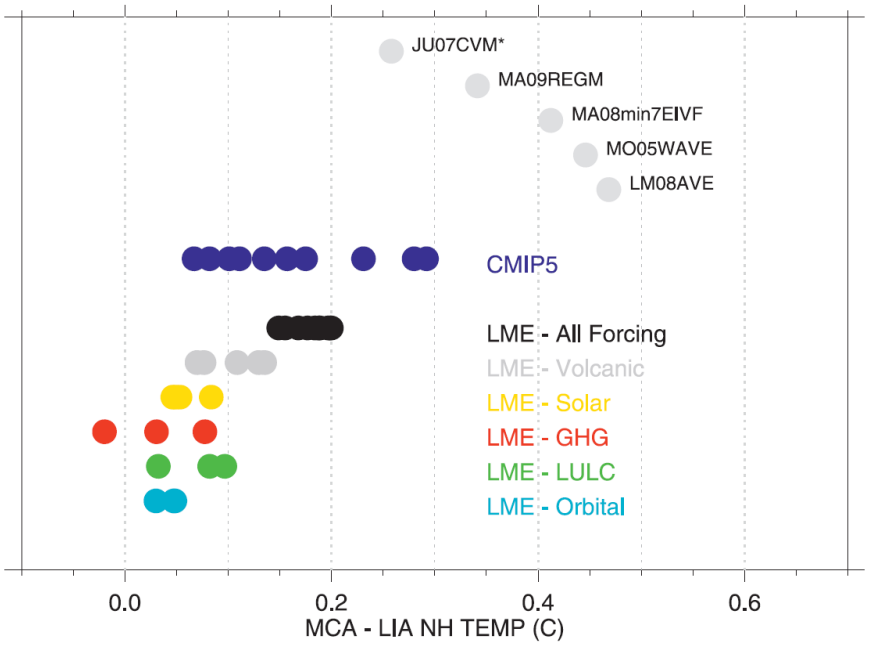
Introduction

https://www.cesm.ucar.edu/projects/community-projects/LME/



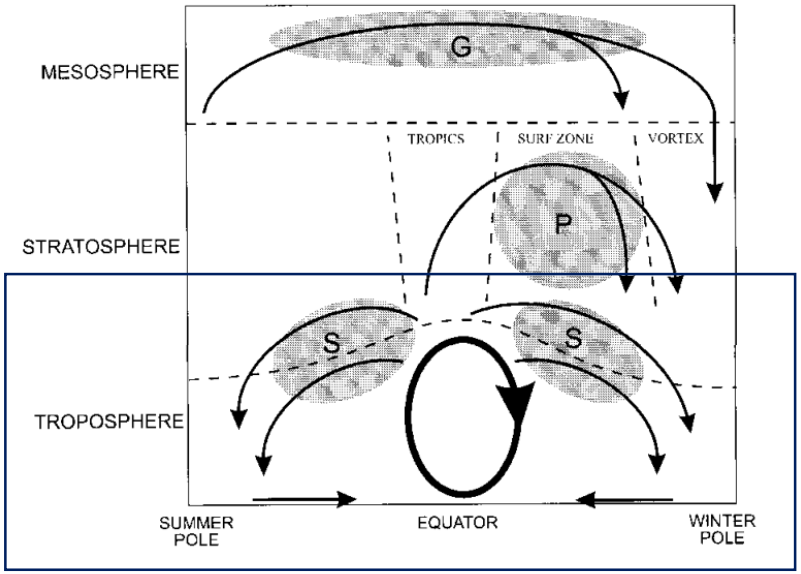




Otto-Bliesner et al. 2016

✓ **Volcanic eruptions :** important role for climate change during last millennium

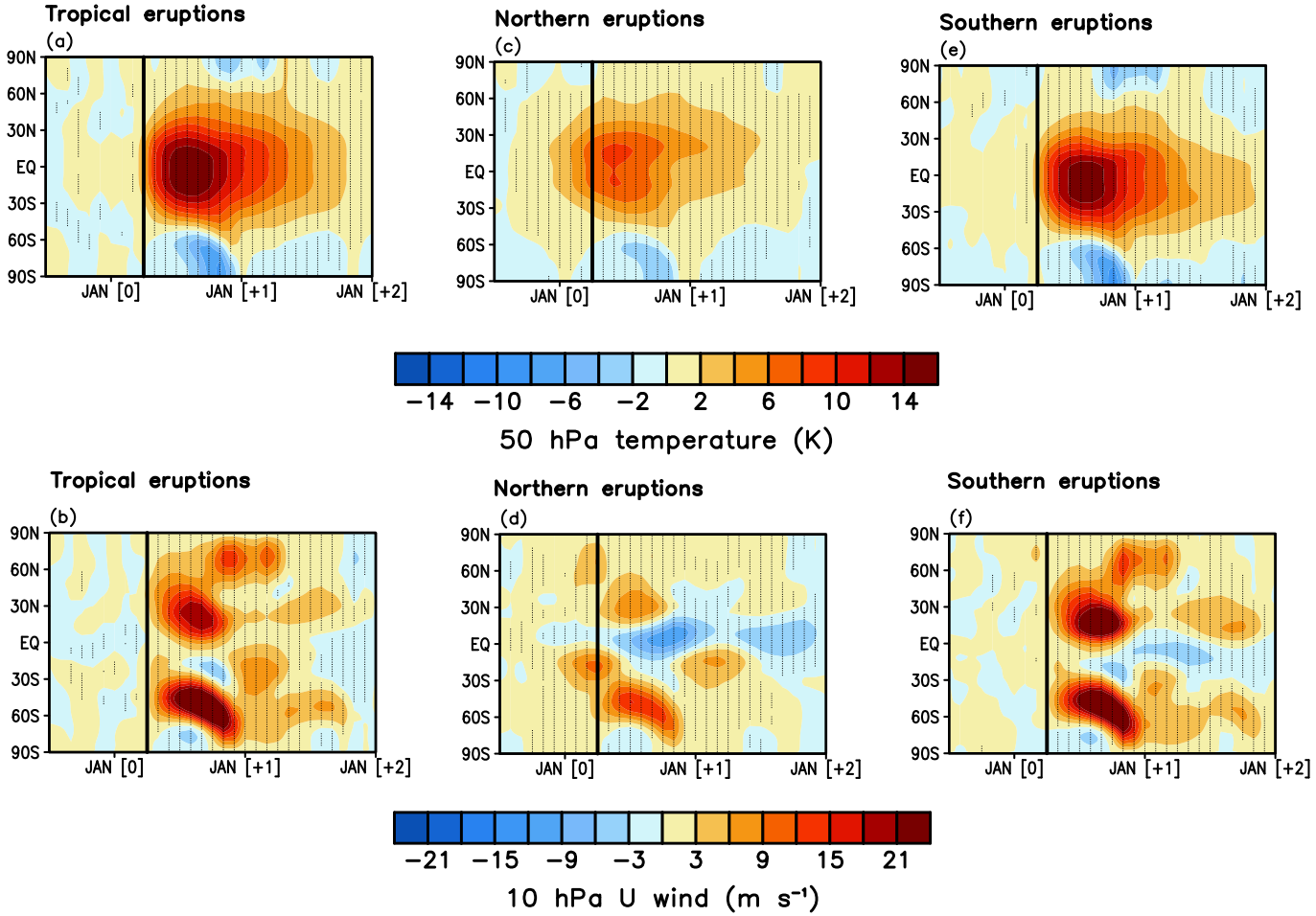
Volcanic aerosols



Plumb (2002)

✓ **Volcanic aerosols have different meridional structures**

Lower stratospheric temperature, zonal wind



Stratospheric warming → meridional temp. gradient→ **subtropical westerly winds**

→ equatorward wave propagation → less waves break at high.-lats.

→ **Arctic polar vortex**

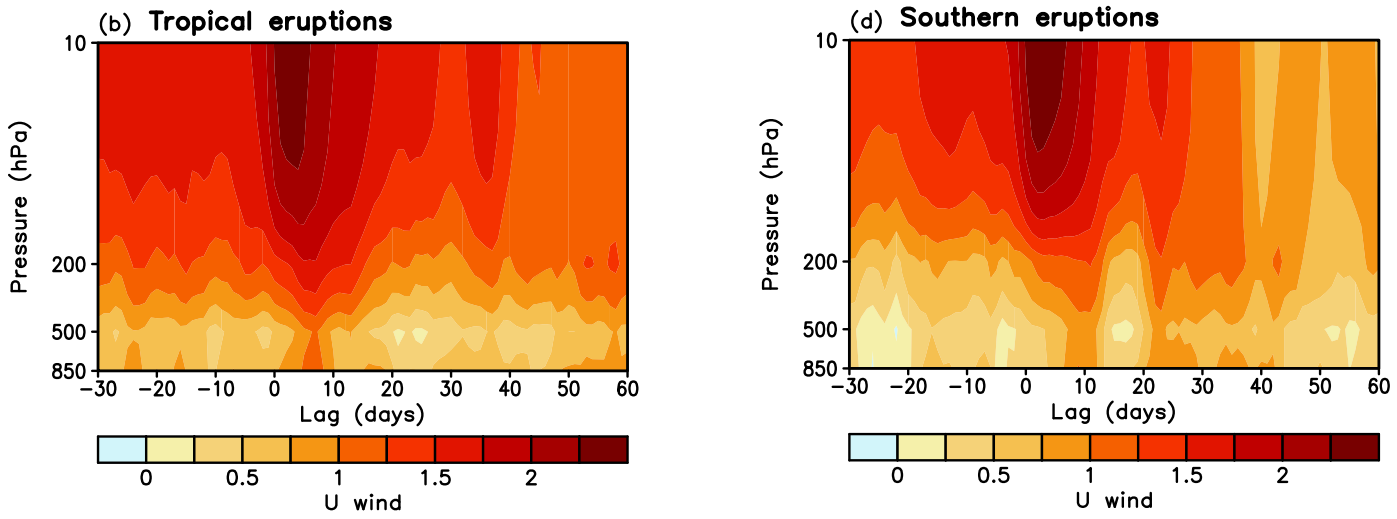
: strongly shown after **tropical, southern eruptions**

(Southern eruption has greater tendencies)

❖ Northern eruptions have much weaker responses (weaker temp.-gradient)

Stratosphere to troposphere coupling

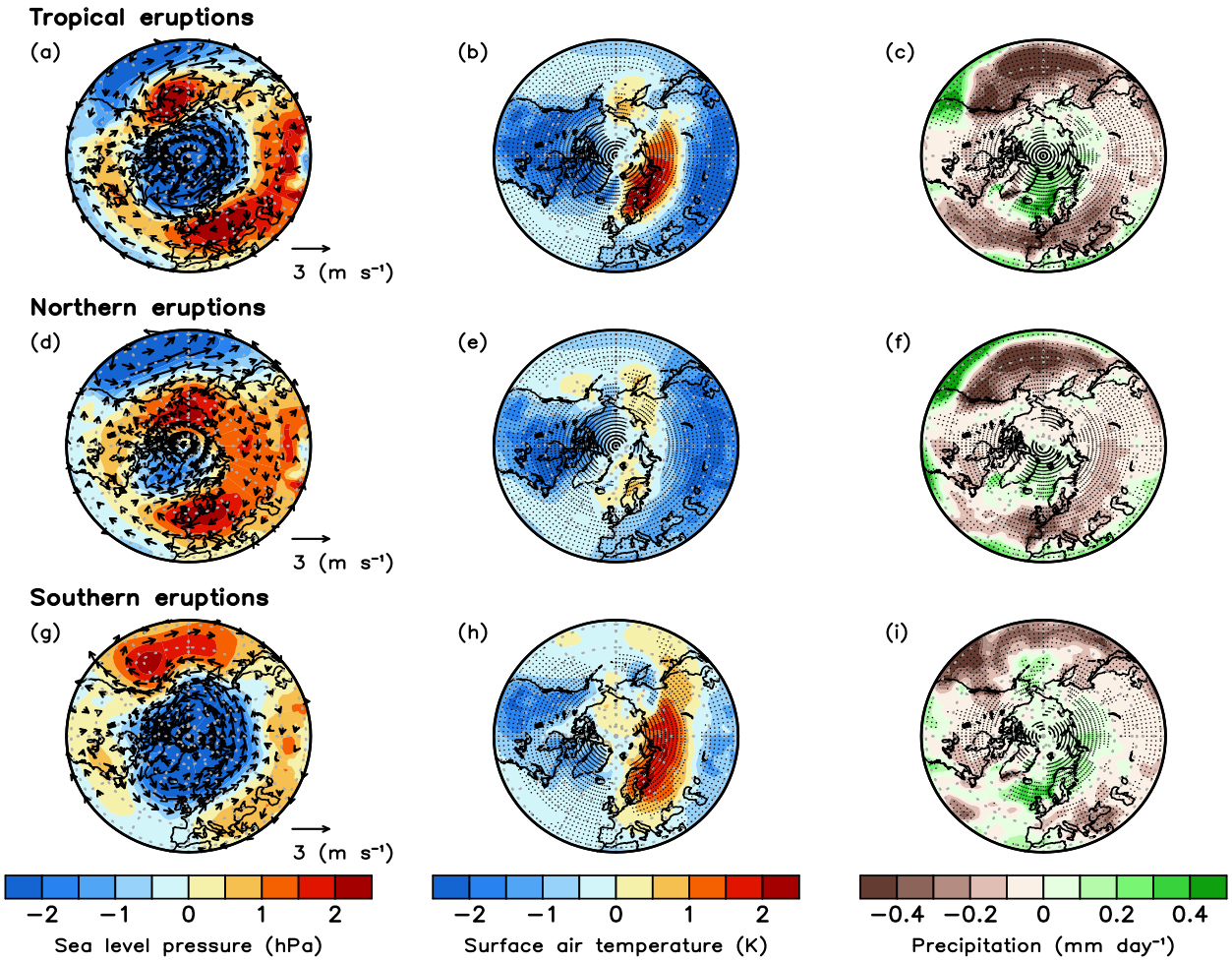
Events during DEC to FEB



Following tropical, southern eruptions,

- Arctic polar vortex enhance → propagates to lower troposphere

Winter (DJF) surface climate responses



Northern Eurasia winter warming, wetting

- ✓ Only shown following tropical and southern eruptions
- ✓ Southern eruptions have much extended responses