

# ICES Biennial 2015

Bob Bishop

Geneva, 6 November 2015



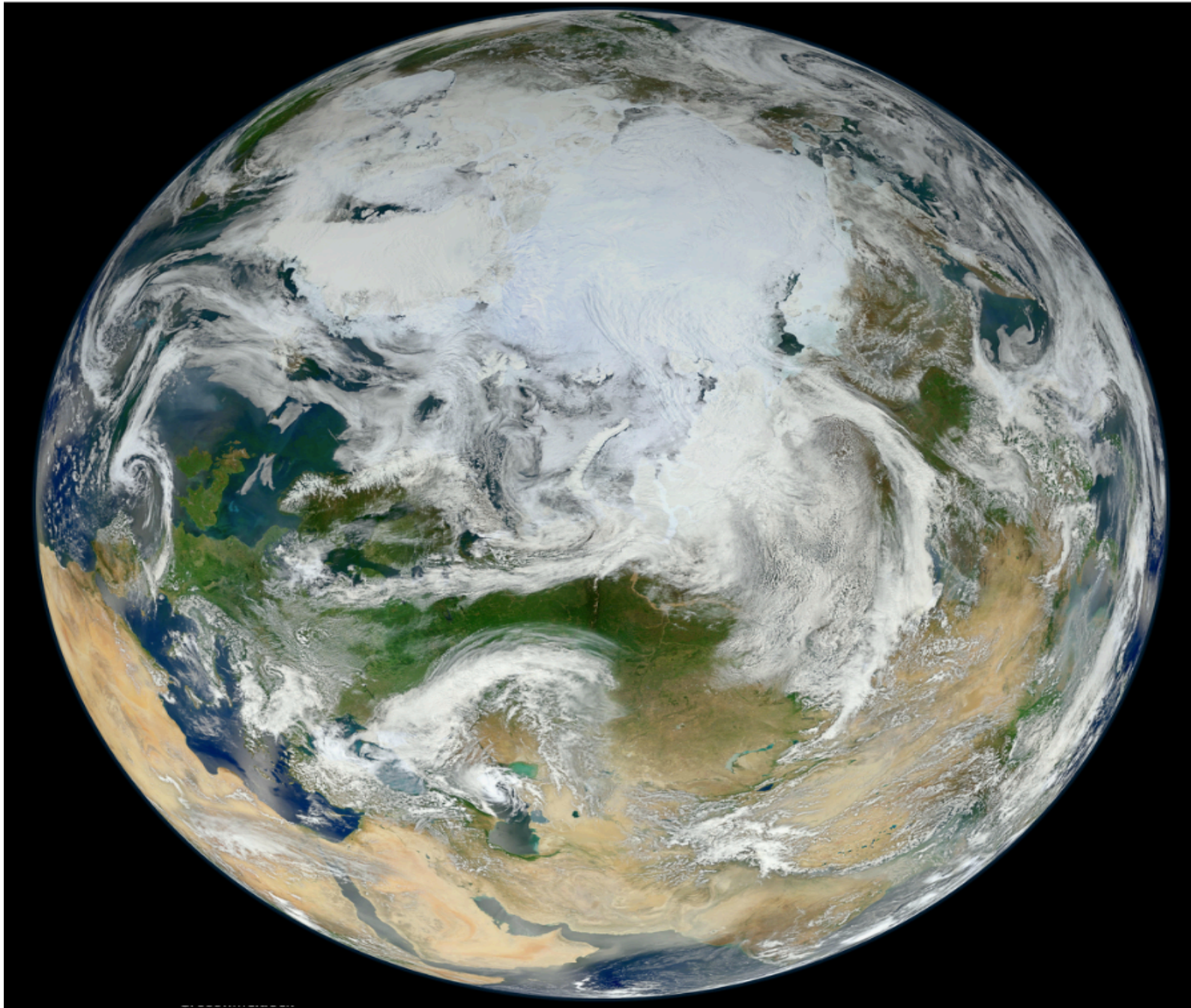
# Understanding the full holistic process

- Everything is transforming
- Everything is connected
- Everything is in motion

# Modelling the Whole Earth System

- Impact of Nature on Society
- Impact of Society on Nature
- Causes and effects - and consequences
- All underlying biogeophysical processes
- Multi-science, multi-scale, unitary & seamless

# Unitary & Seamless



# ICES Organization Philosophy

- Neutral
- Independent
- Non-Commercial

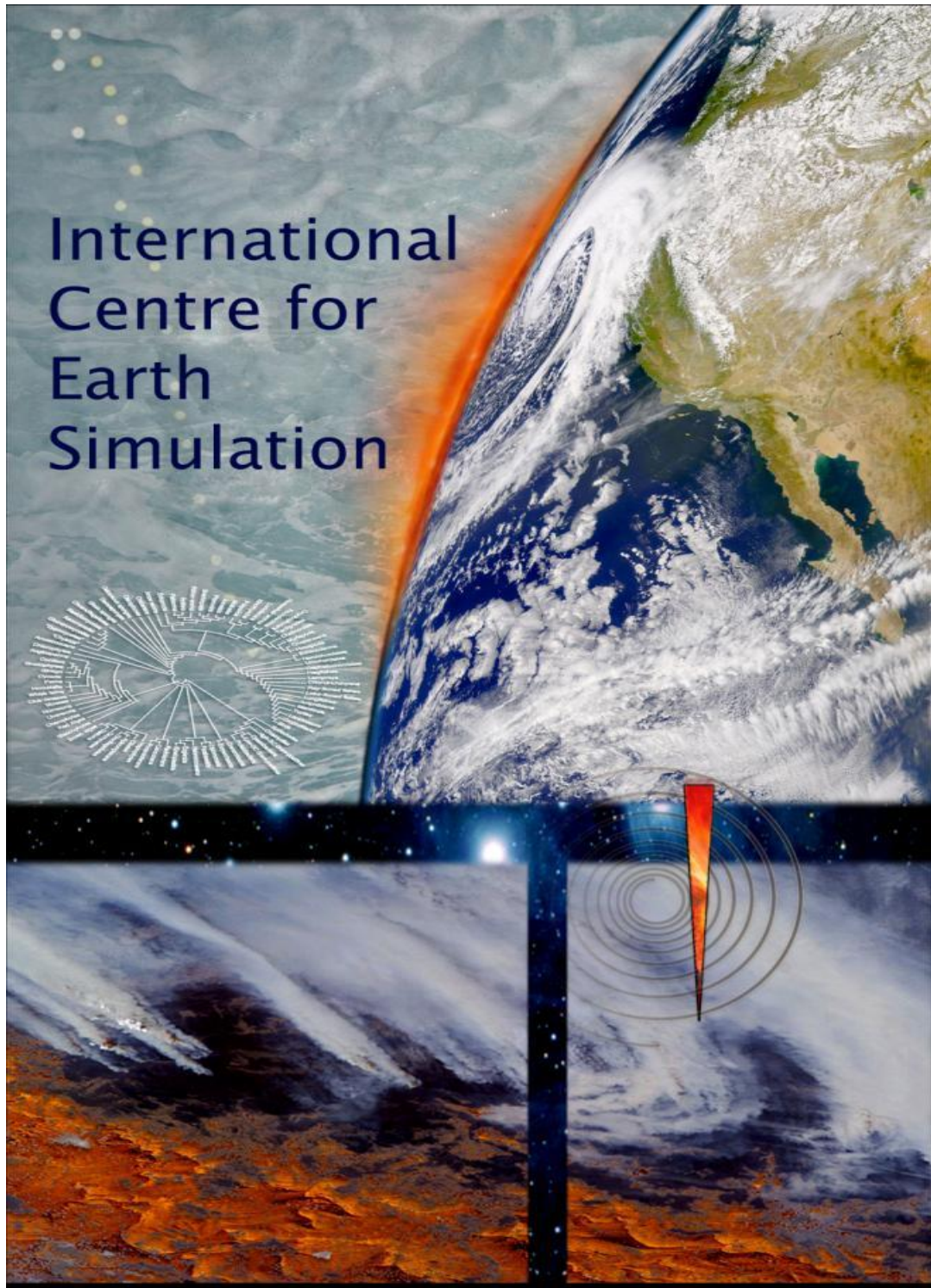
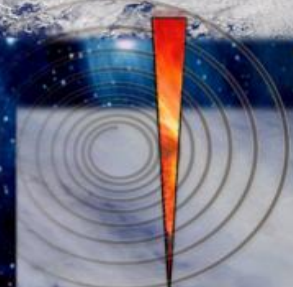
***Geneva HQ + Worldwide Partners***

# The Full Scope of ICES

- extreme weather, floods, droughts, cold, dust storm, fires
- climate change, global warming, sea-level rise
- natural capital resource depletion
- energy-food-water security
- disaster risk management
- risk & resilience
- Ecologies
- Cities

***sustainability, public safety, social well-being***

# International Centre for Earth Simulation





Building a ***Virtual Earth***

- to better understand the real world

Building *Virtual Nations*

Building *Virtual Cities*

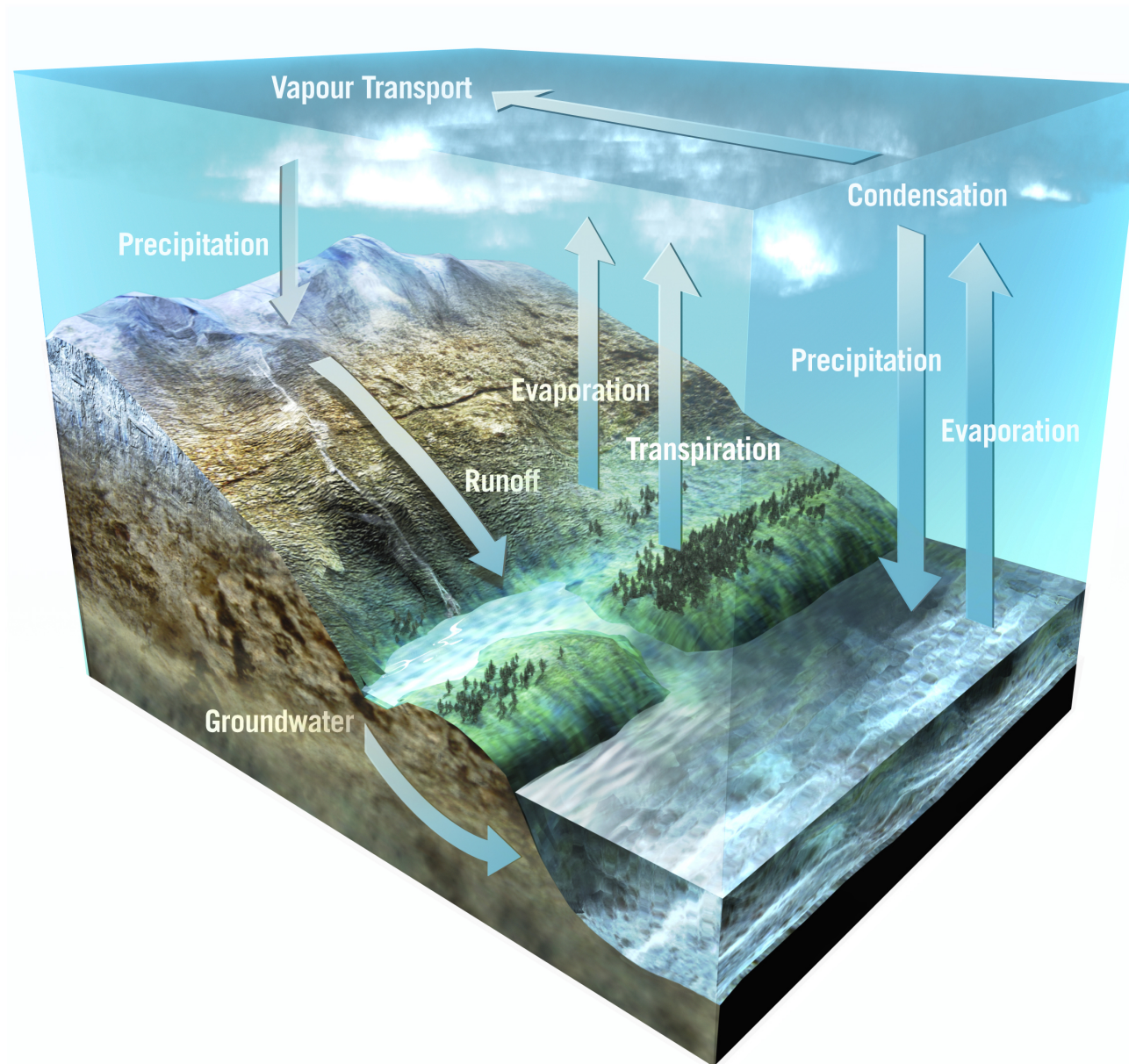
The real world is massively complex



# Continuous Land-Sea-Sky couplings & fluxes



# Co-evolution, feedback & synergy between processes



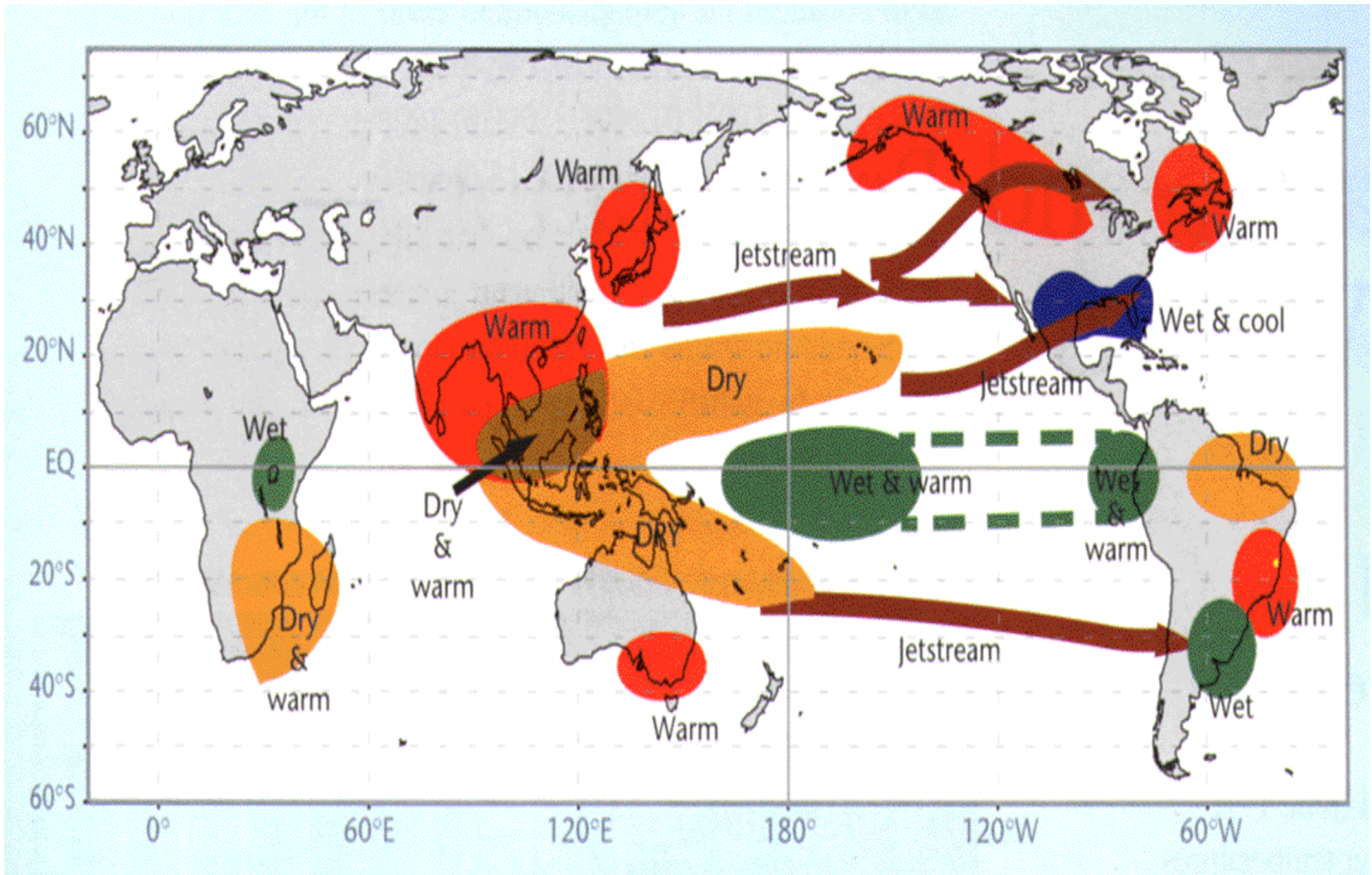
# Convection & cloud physics require high-resolution



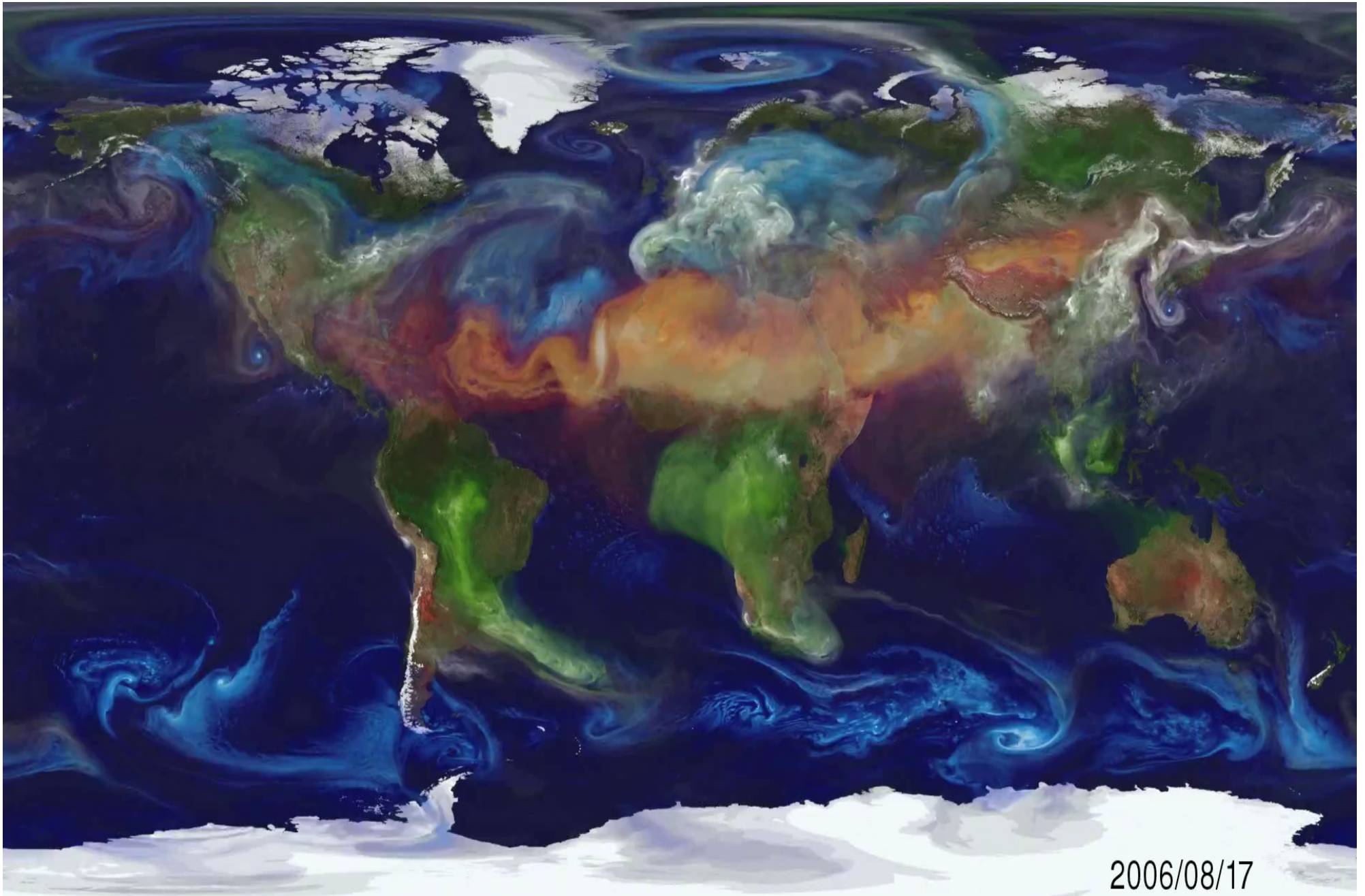
Coastal zones are extremely non-linear



# Global teleconnections: Monsoons & El Niño

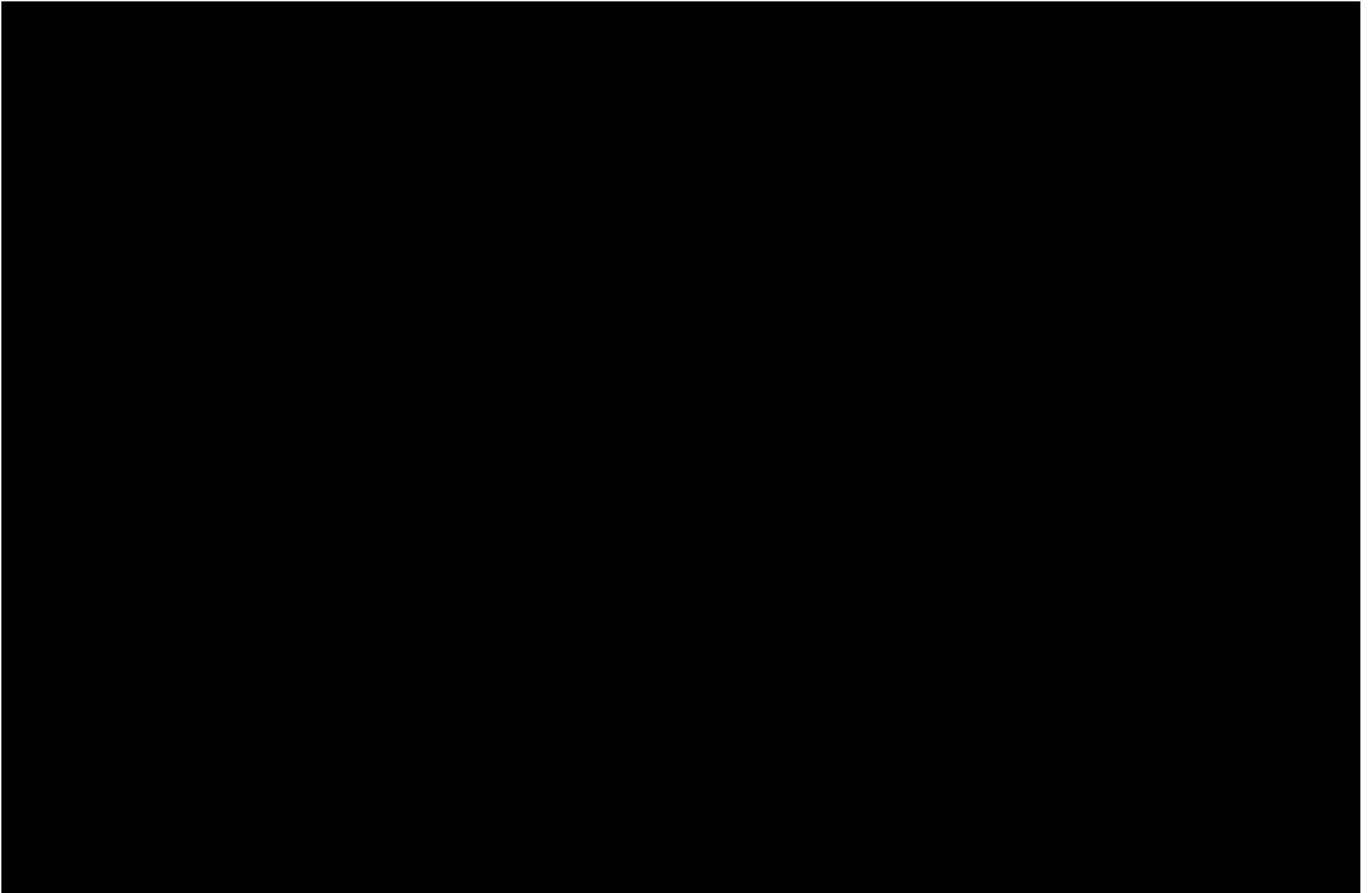


# Aerosol dispersion links the planet

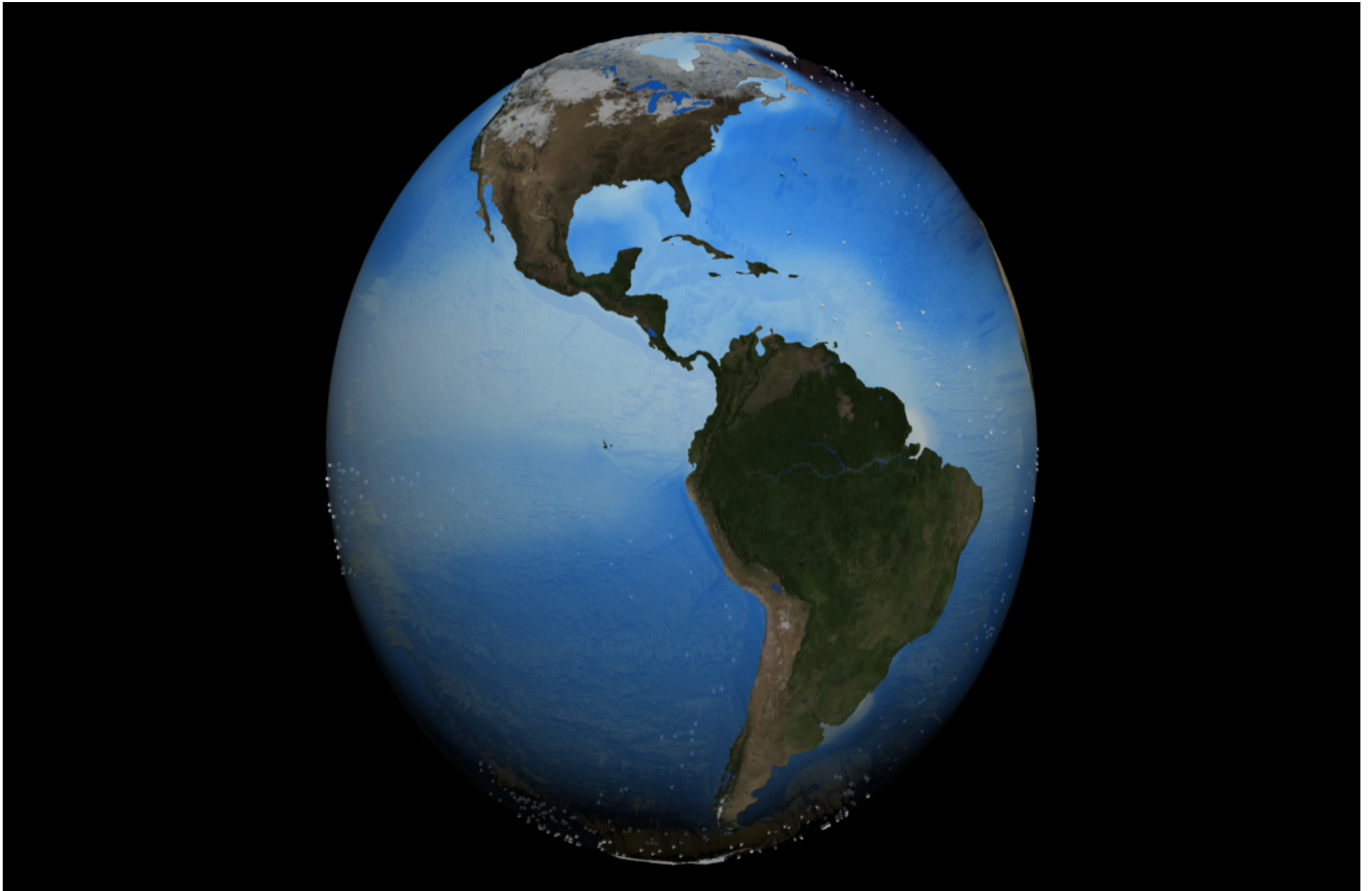




Surface eddy currents transfer heat regionally



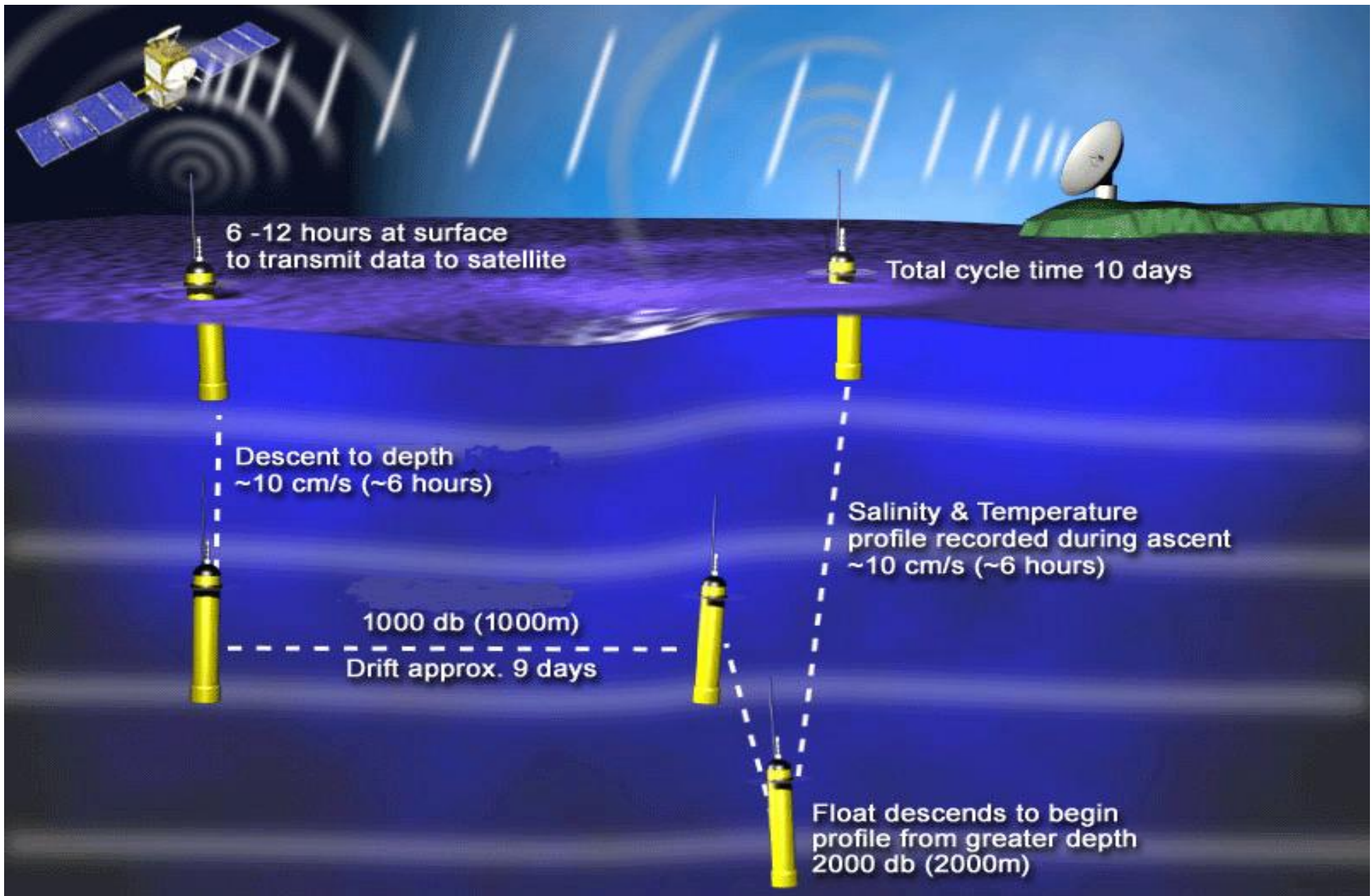
The Ocean Conveyor Belt operates globally



Earth Observing Satellites look down on all of this



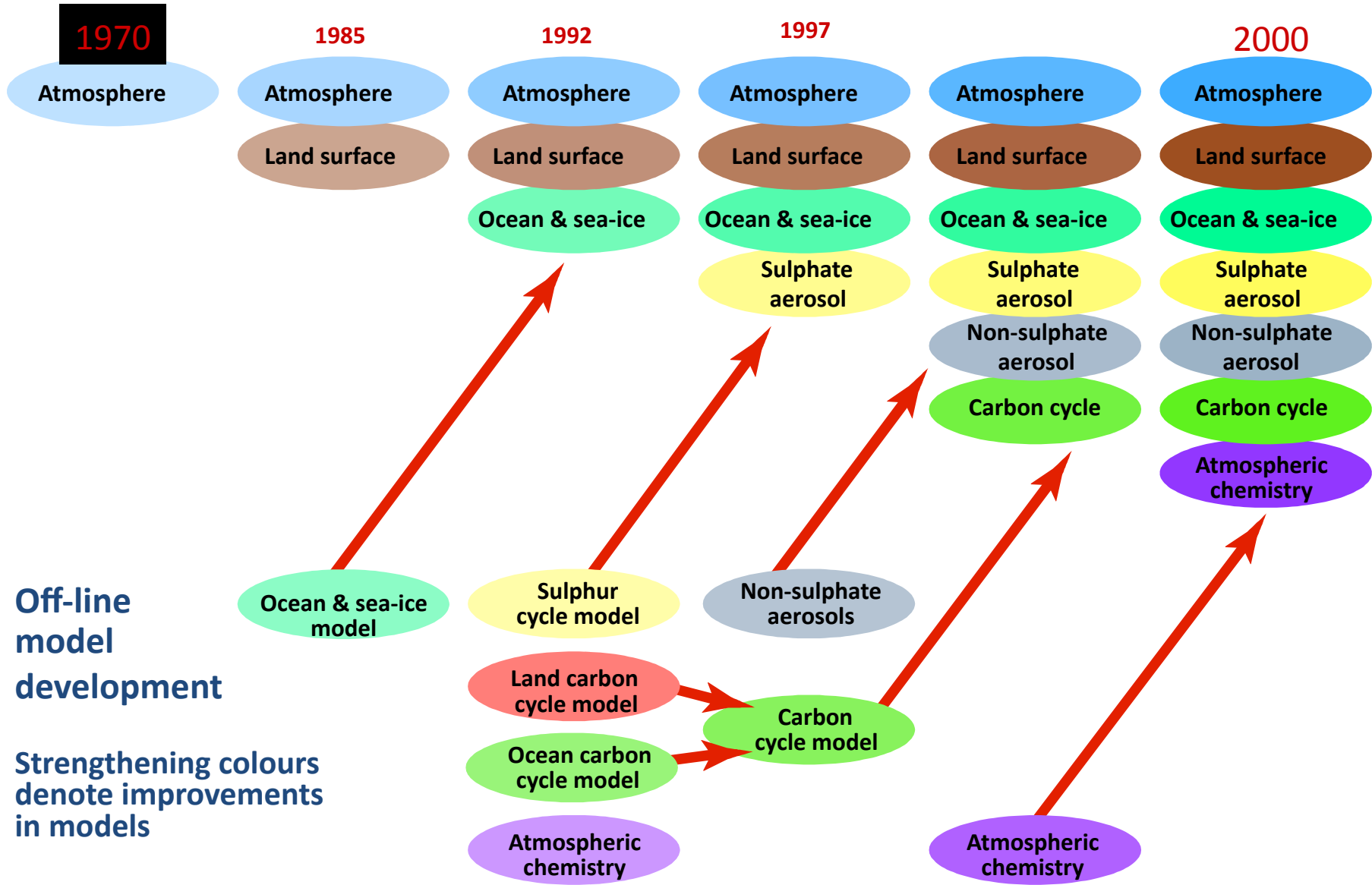
# Argo floats & buoys sample the ocean's status



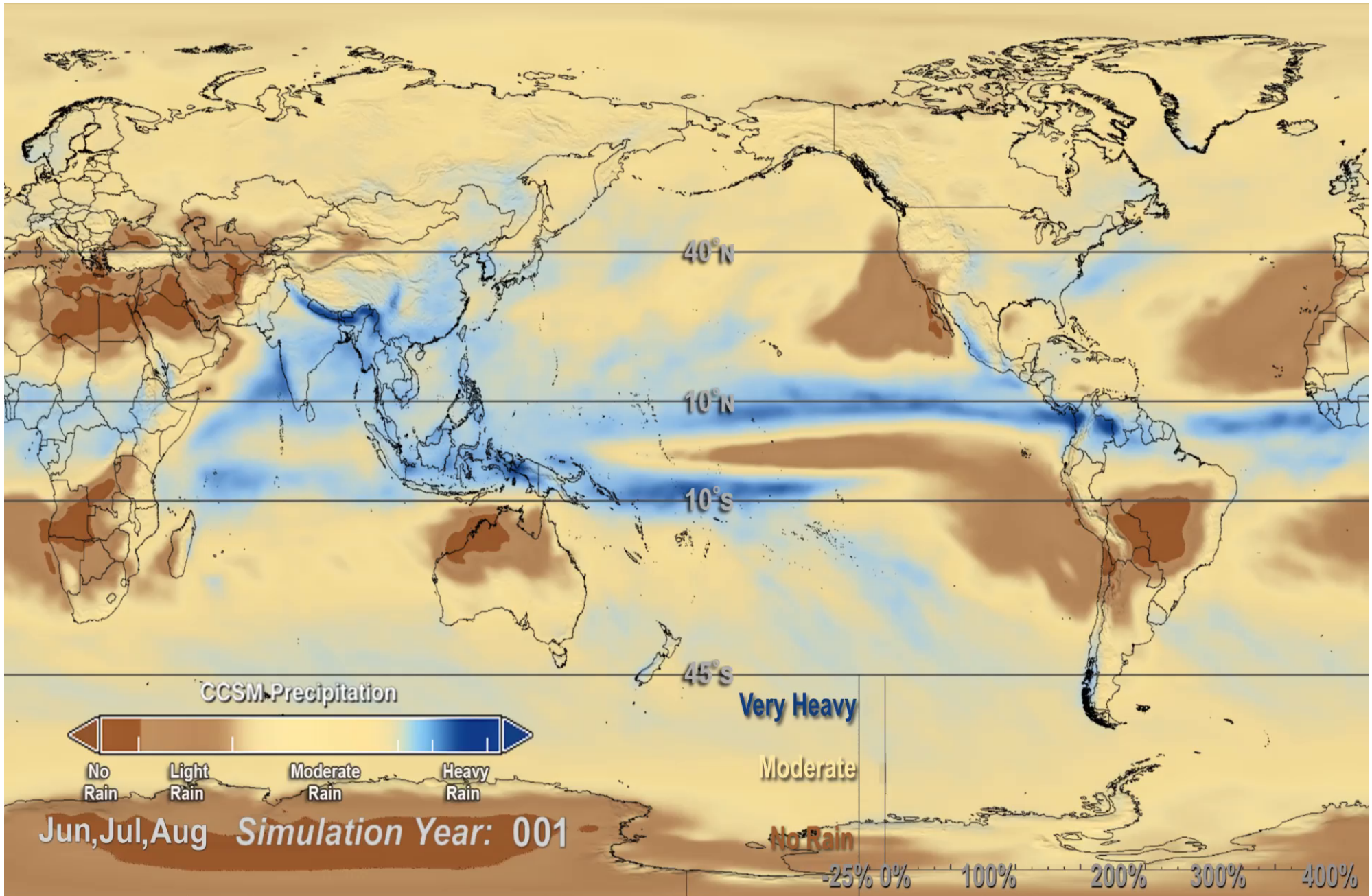
# Supercomputers crunch the numbers



# Comprehensive Earth System Models are evolving



# Wet is getting wetter, dry getting dryer

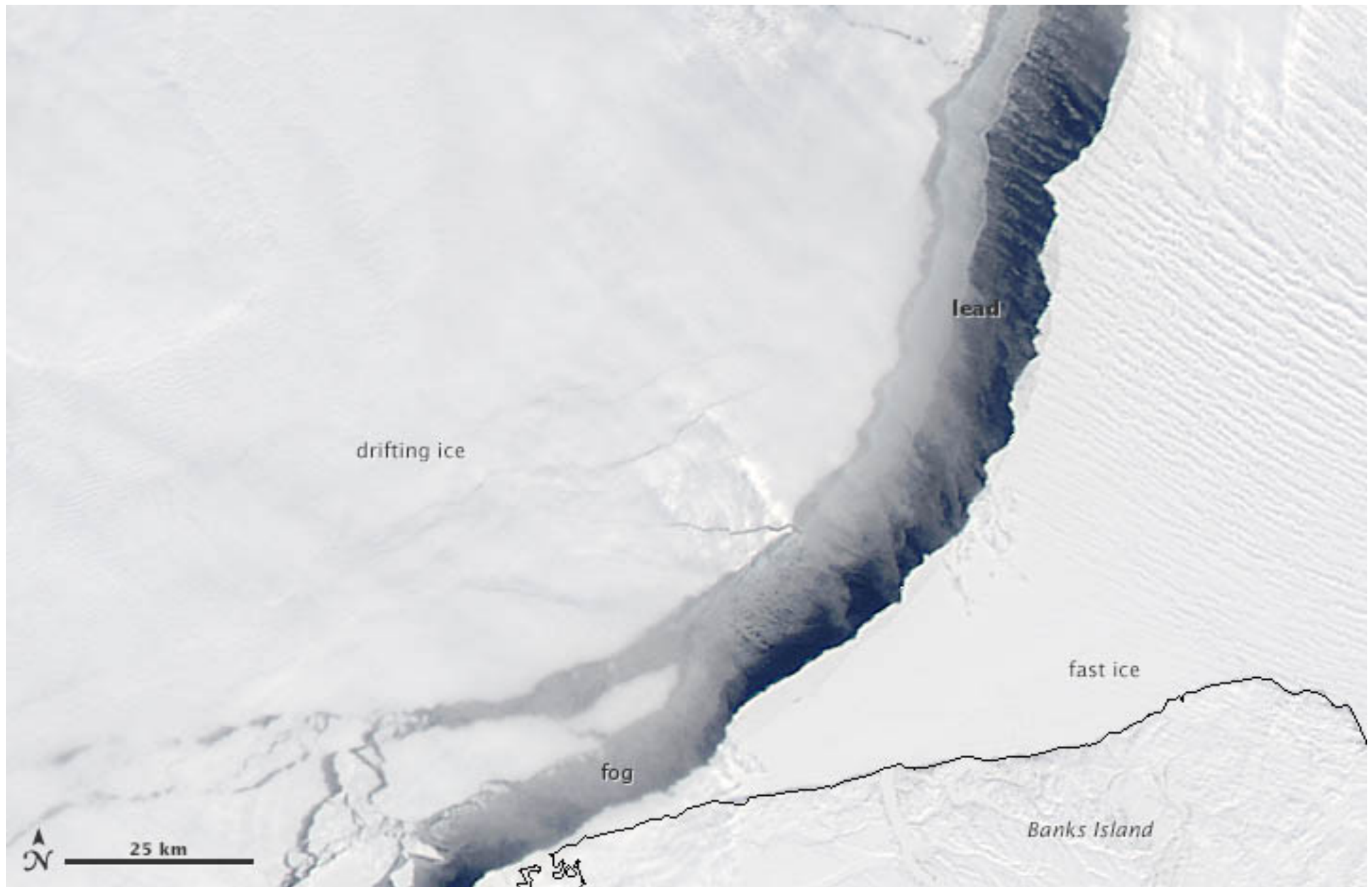


The Arctic Ocean is rapidly becoming ice free

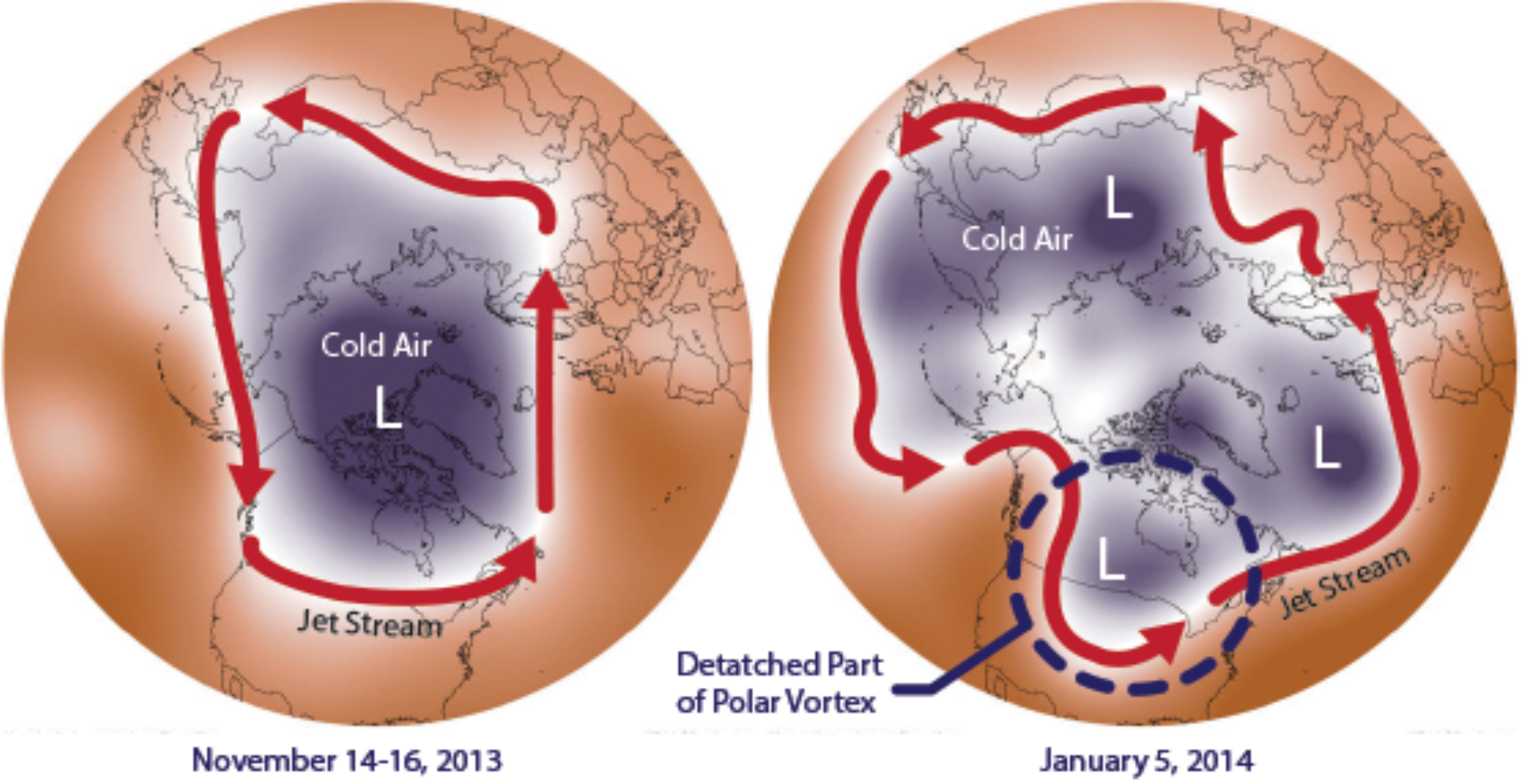




# Ice-sheets are thinning and permafrost is melting



# The Northern Polar Jet Stream has become unstable



# Understanding the way Earth Systems interact



# UNFCCC COP21 starts this month in Paris

- 180+ nations
- North-South divide
- Global Climate Fund
- Is 2<sup>0</sup>C too high for safety?
- Integrating SDGs and DRR
- Policing, penalties & payors

***The great challenge is to find a solution in time!***

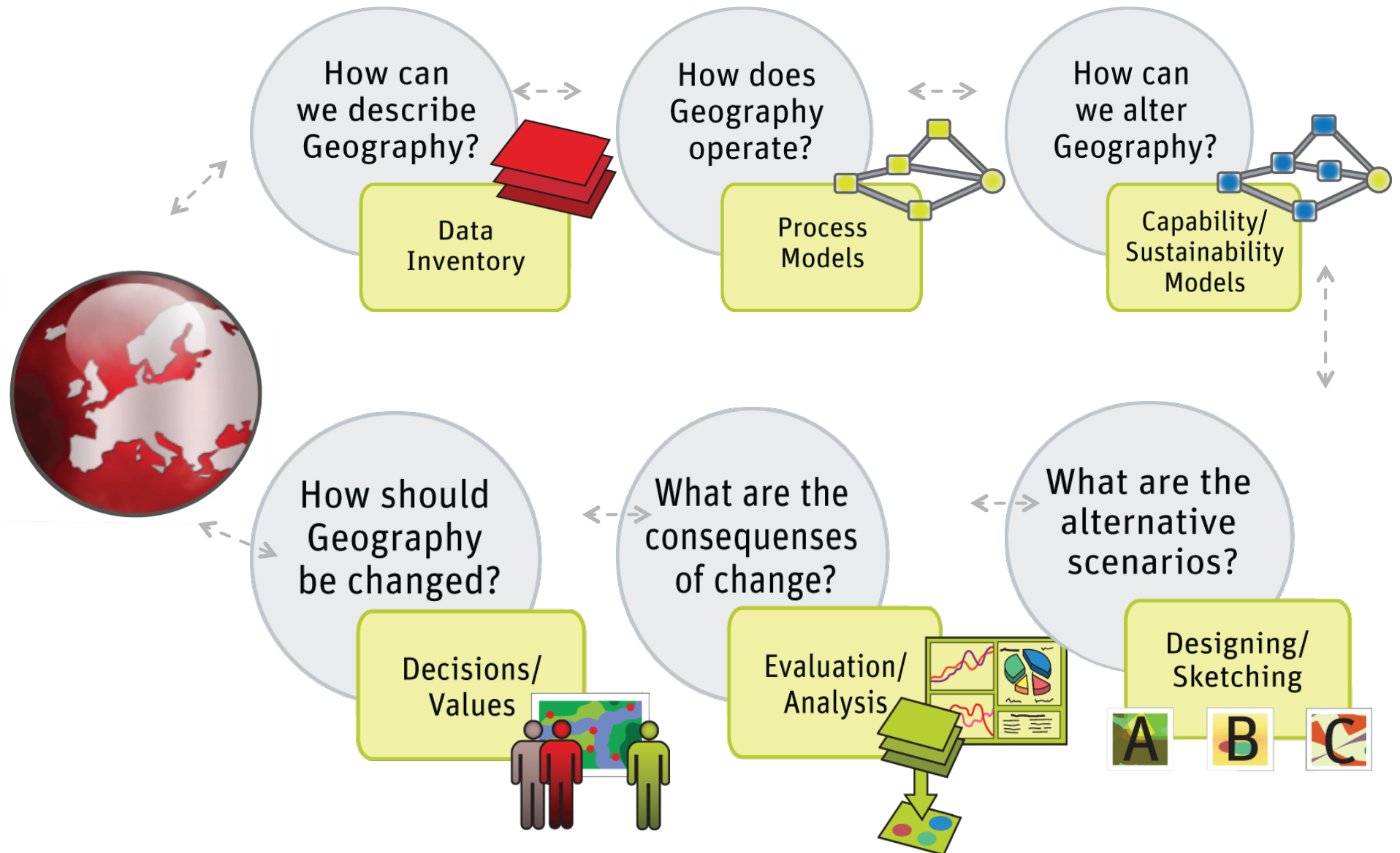
# Our Natural & Social Systems are interwoven

Abrupt changes often cause:

- Sequential collapse
- Synchronous collapse
- Multiple synchronous collapse

***As cascading dominoes fall across sectoral silos***

# Paving the way to an ecological civilization



# TEST: Global-Regional-Local Planning



# ACCESS

## (Asian Center for Earth System Science)

- The importance of the Himalaya-Tibetan Plateau structure
- The strongest & most widespread monsoon system
- Impacting on 45% of world's population
- Important influence on 16 countries
- Massive challenge of integration

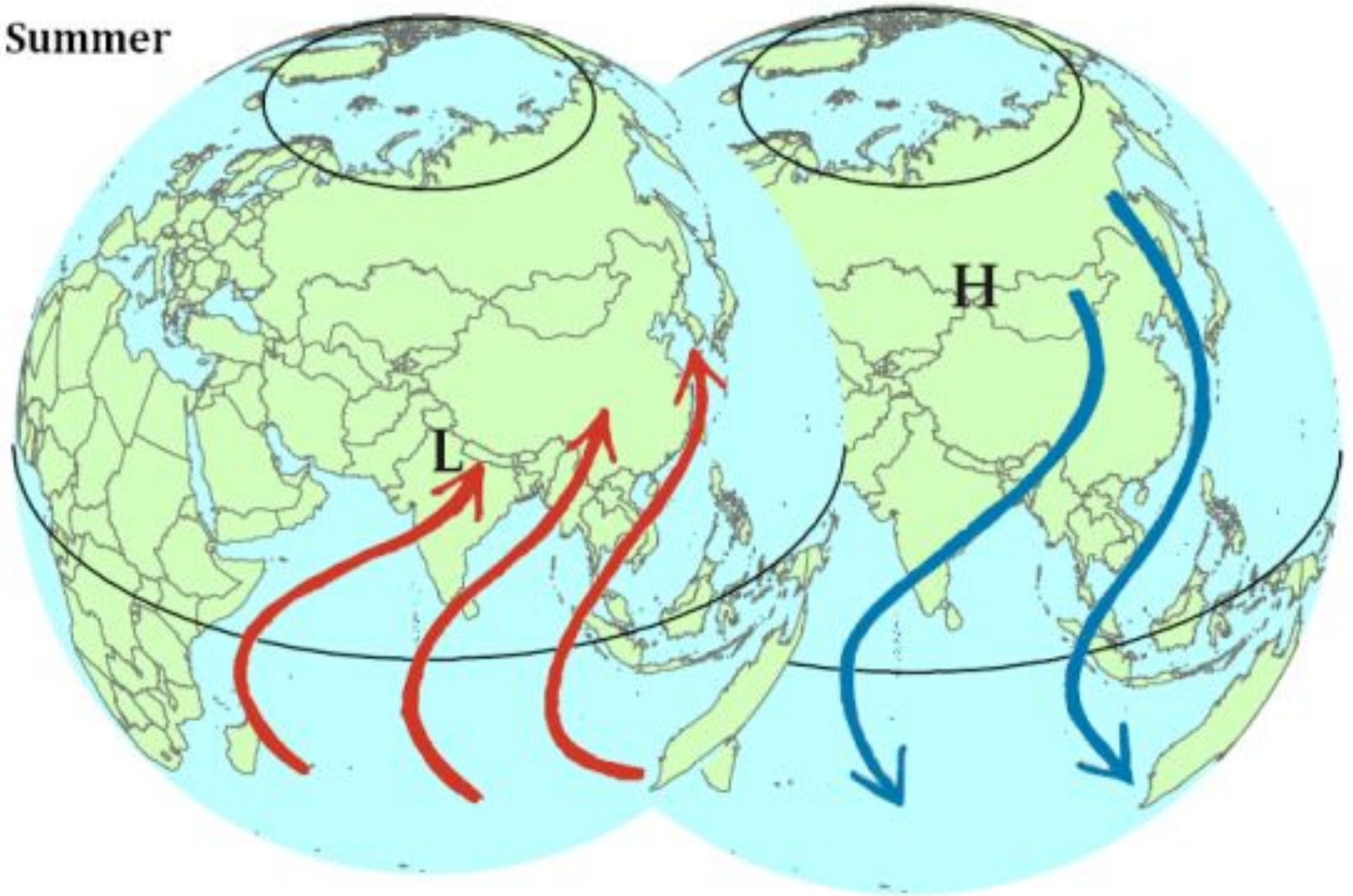
*In collaboration with Chinese Academy of Sciences*  
*- Institute of Advanced Physics*  
*- Laboratory of Atmospheric Sciences & Geophysical*



# Monsun

Winter

Summer



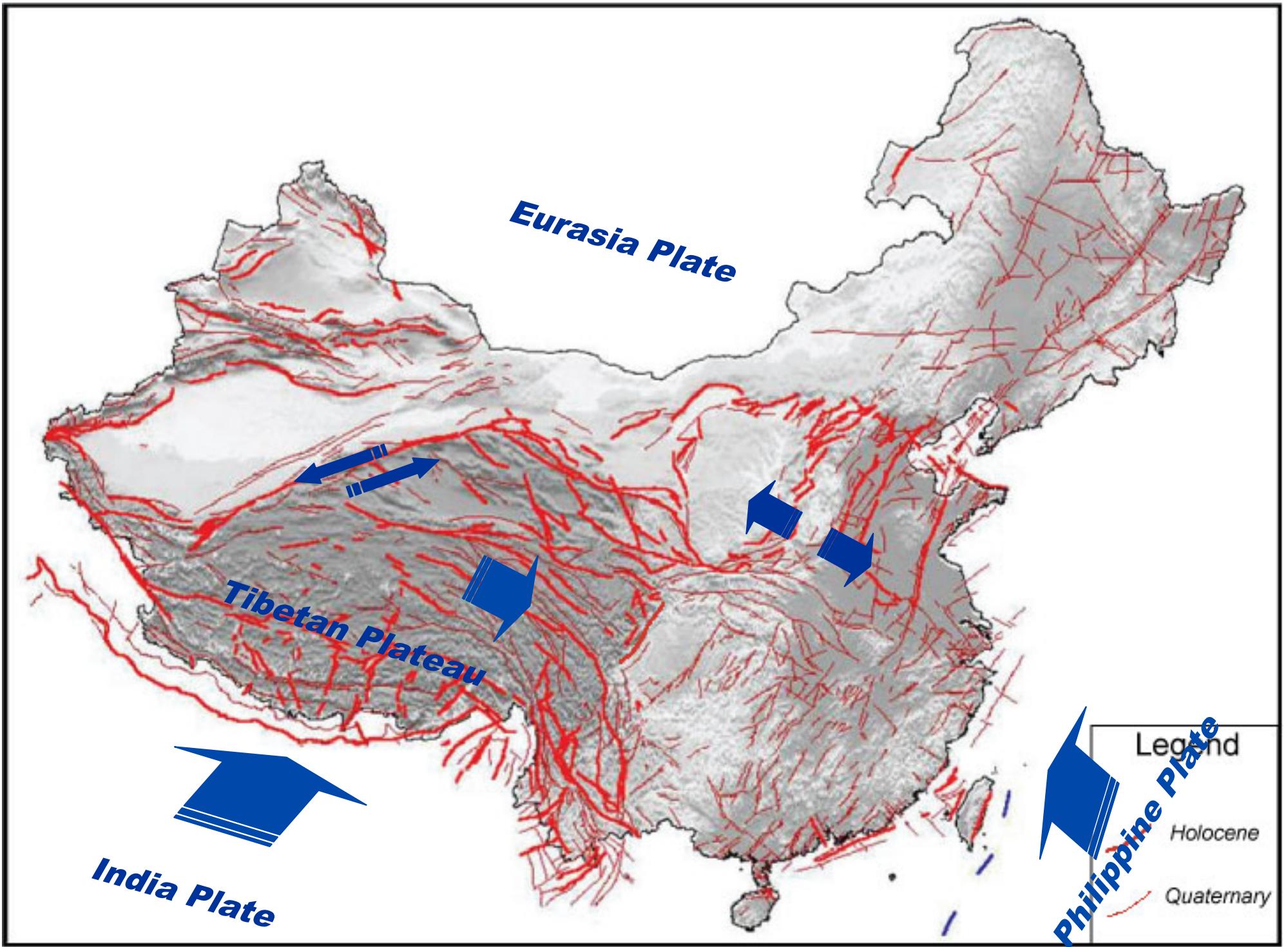
# QLARM

- Delivered by Max Wyss
- 900 loss estimates to date
- Timely and accurate to factor of 2
- Real time mode, and scenario planning mode

# Nepal 2015 quakes were a wake up call



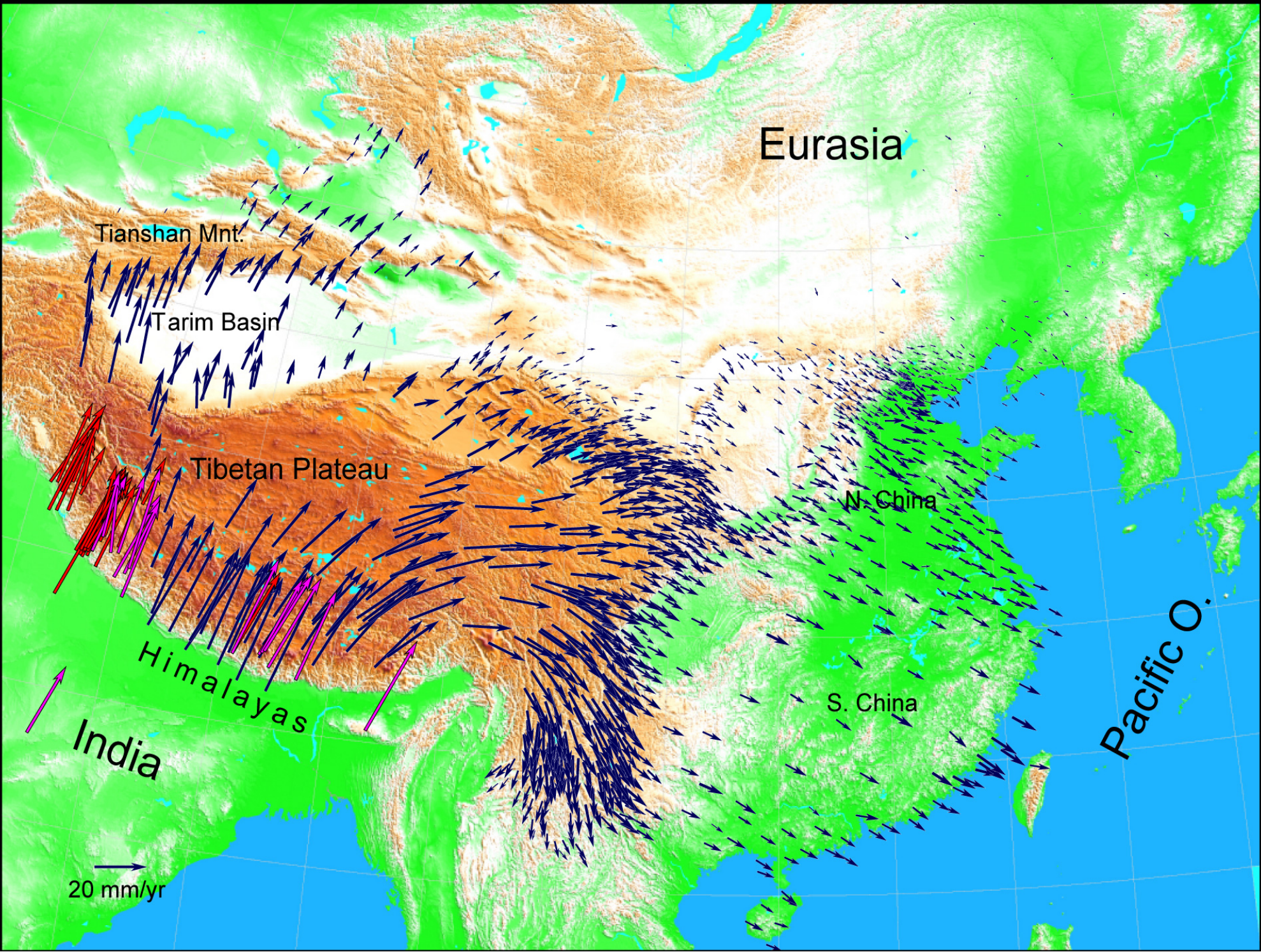
This image was tweeted by @ashbel\_nialler



Legend

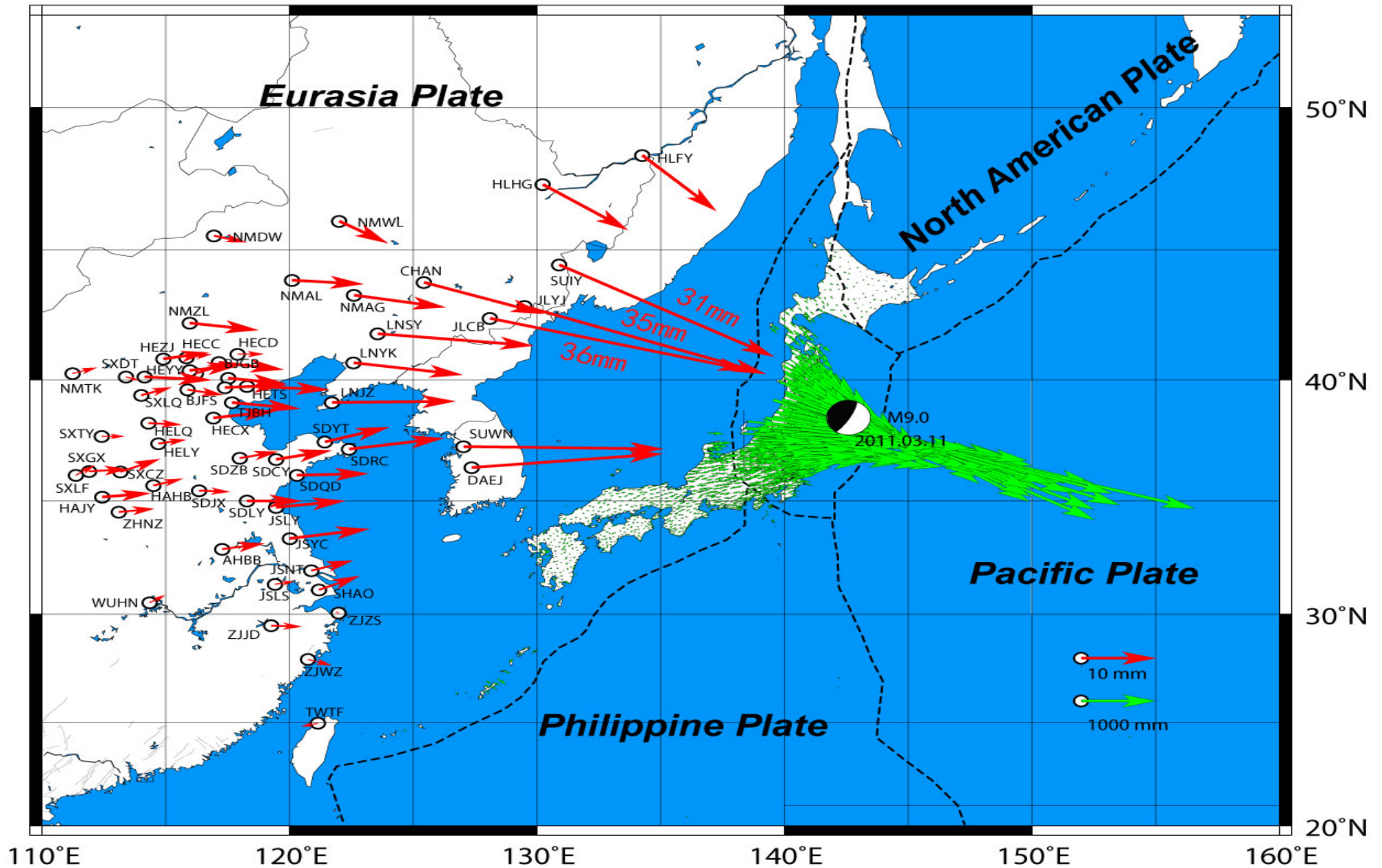
Holocene

Quaternary

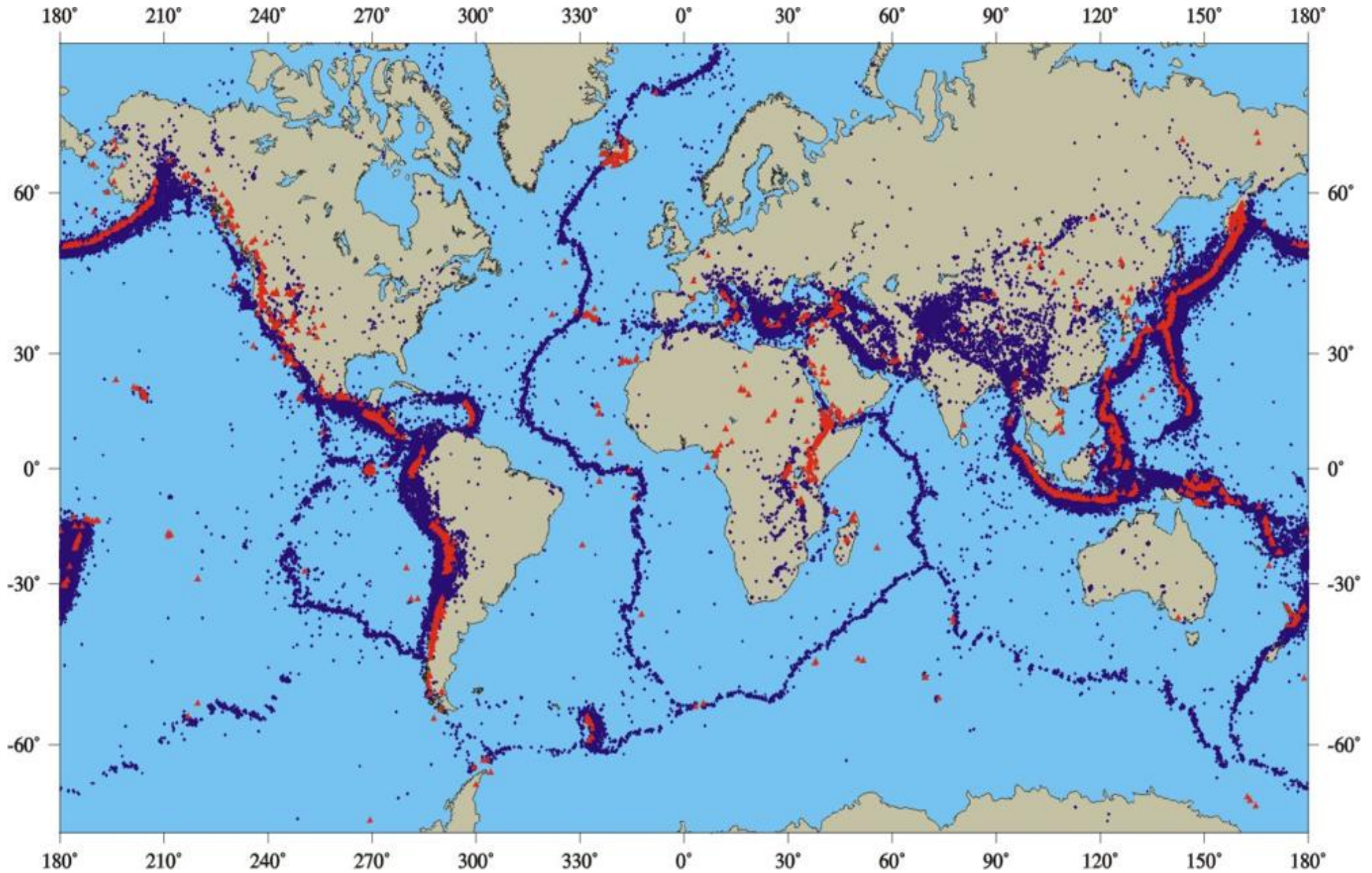


# The Great East Japan Earthquake

11 March 2011



# Quakes are a daily occurrence throughout the world

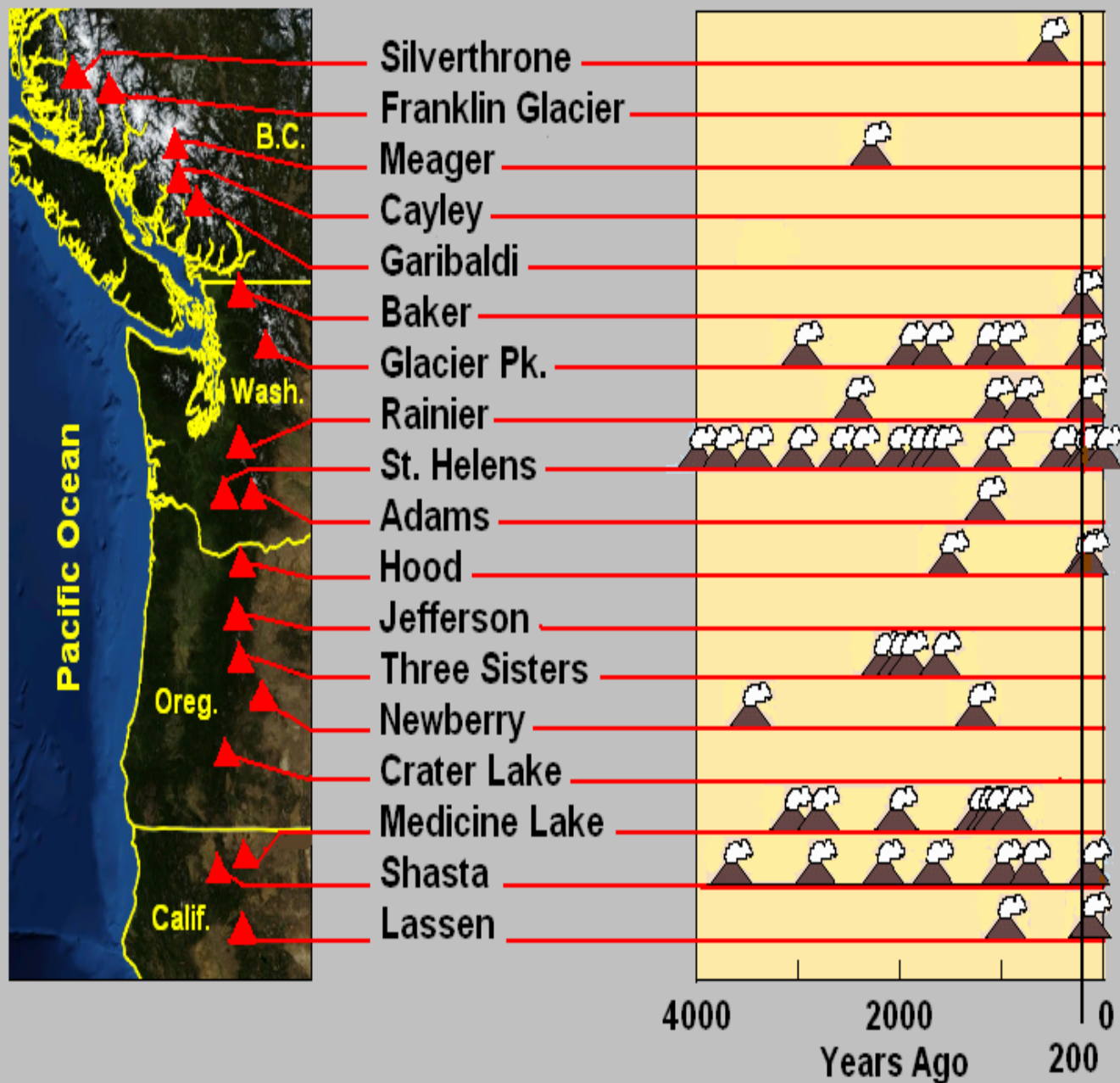


# Cascadian subduction has created 18 volcanoes





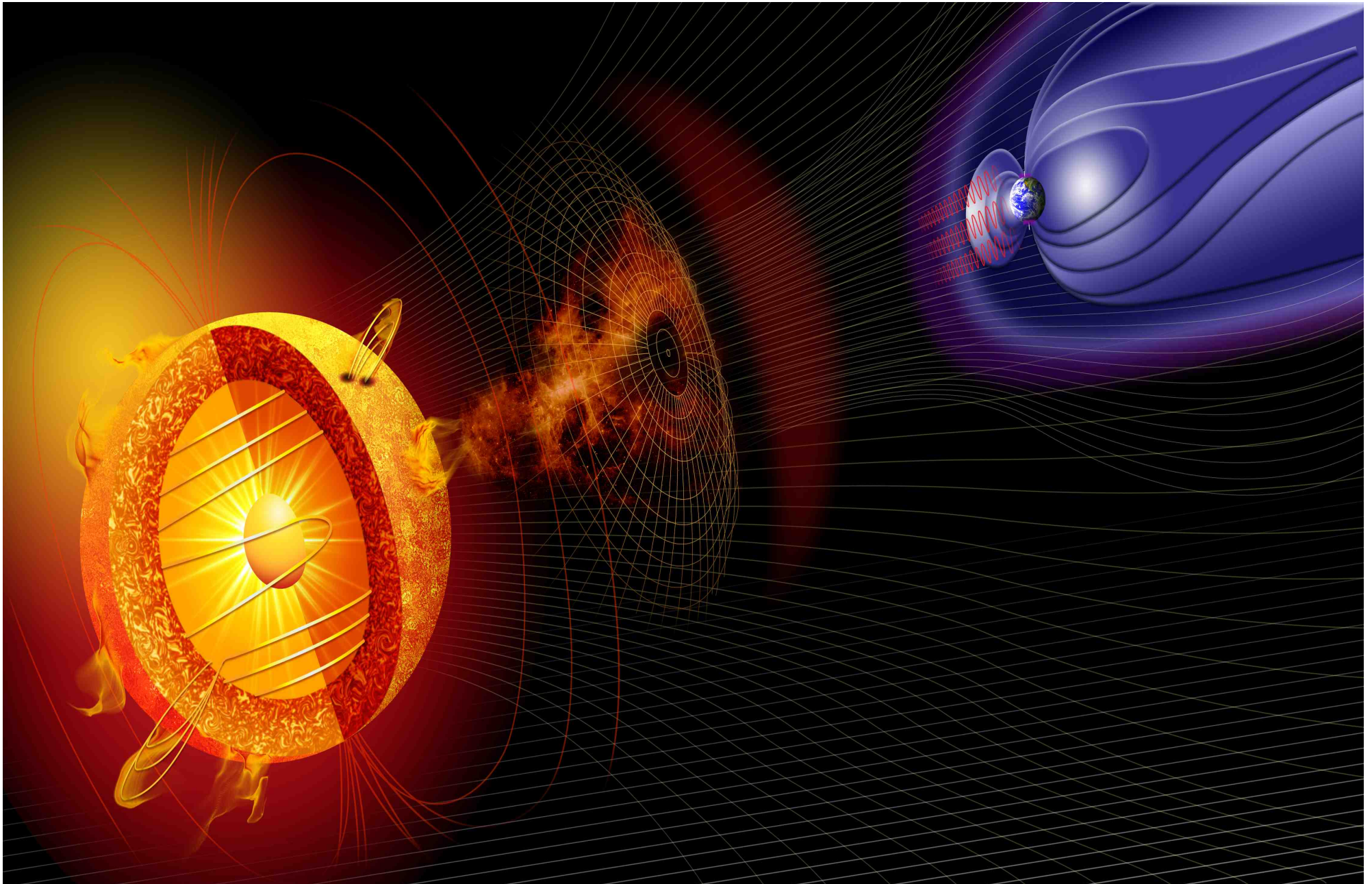
# Cascade Eruptions During The Last 4,000 years



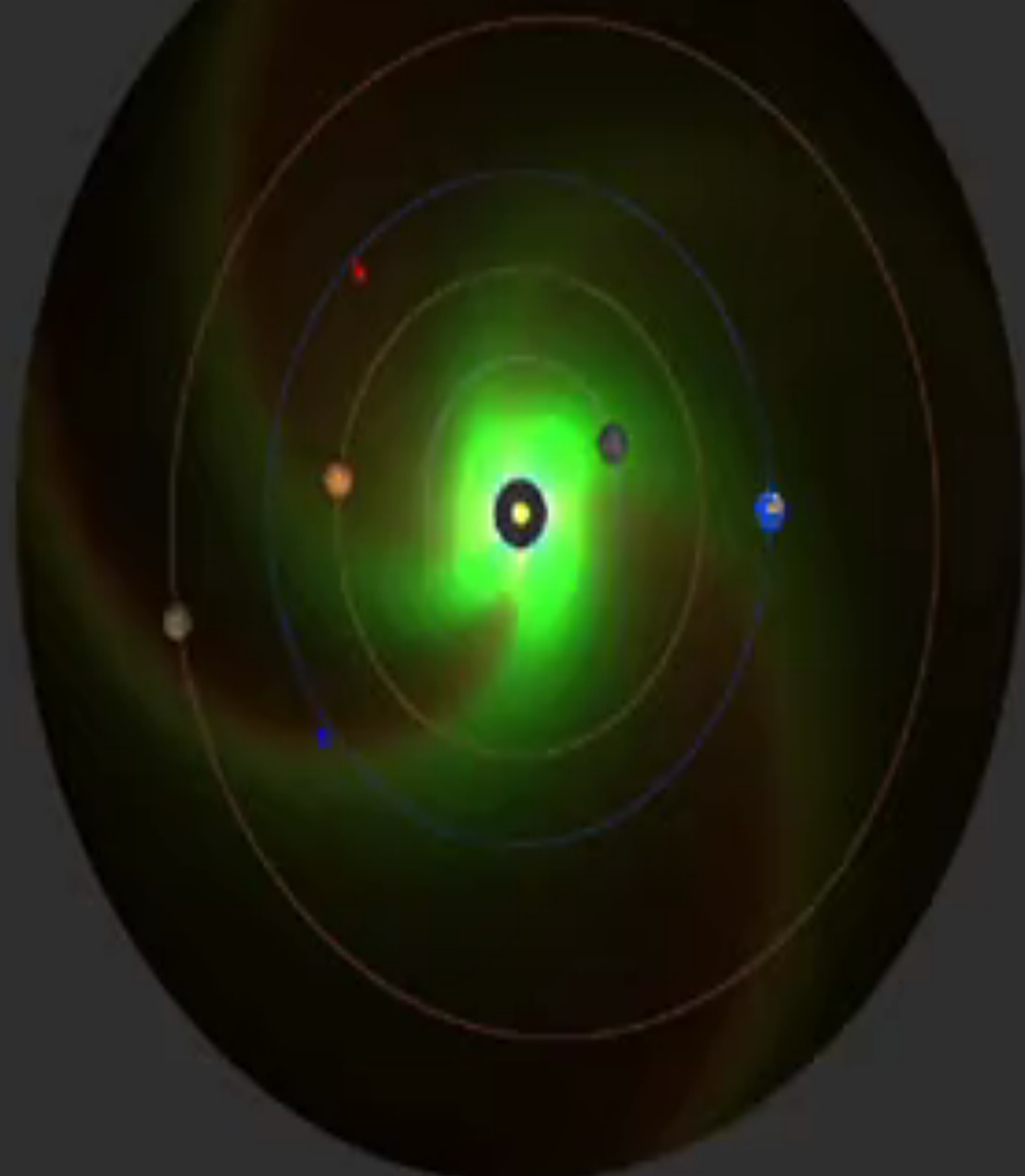


Cascadia Resilience Center

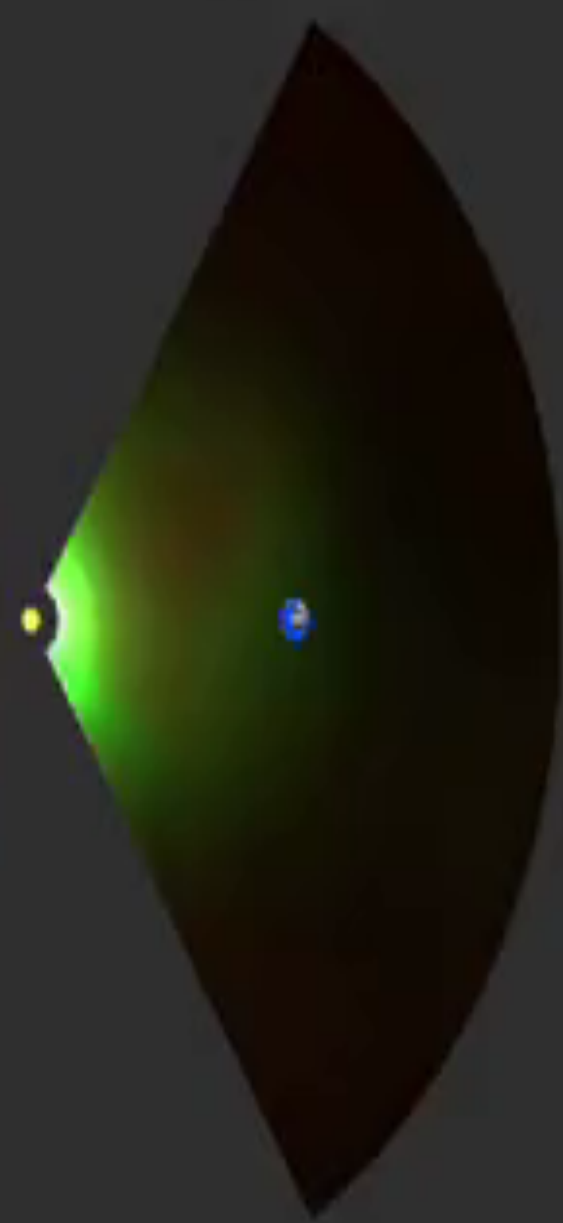
# Space Weather between Sun & Earth is a new science



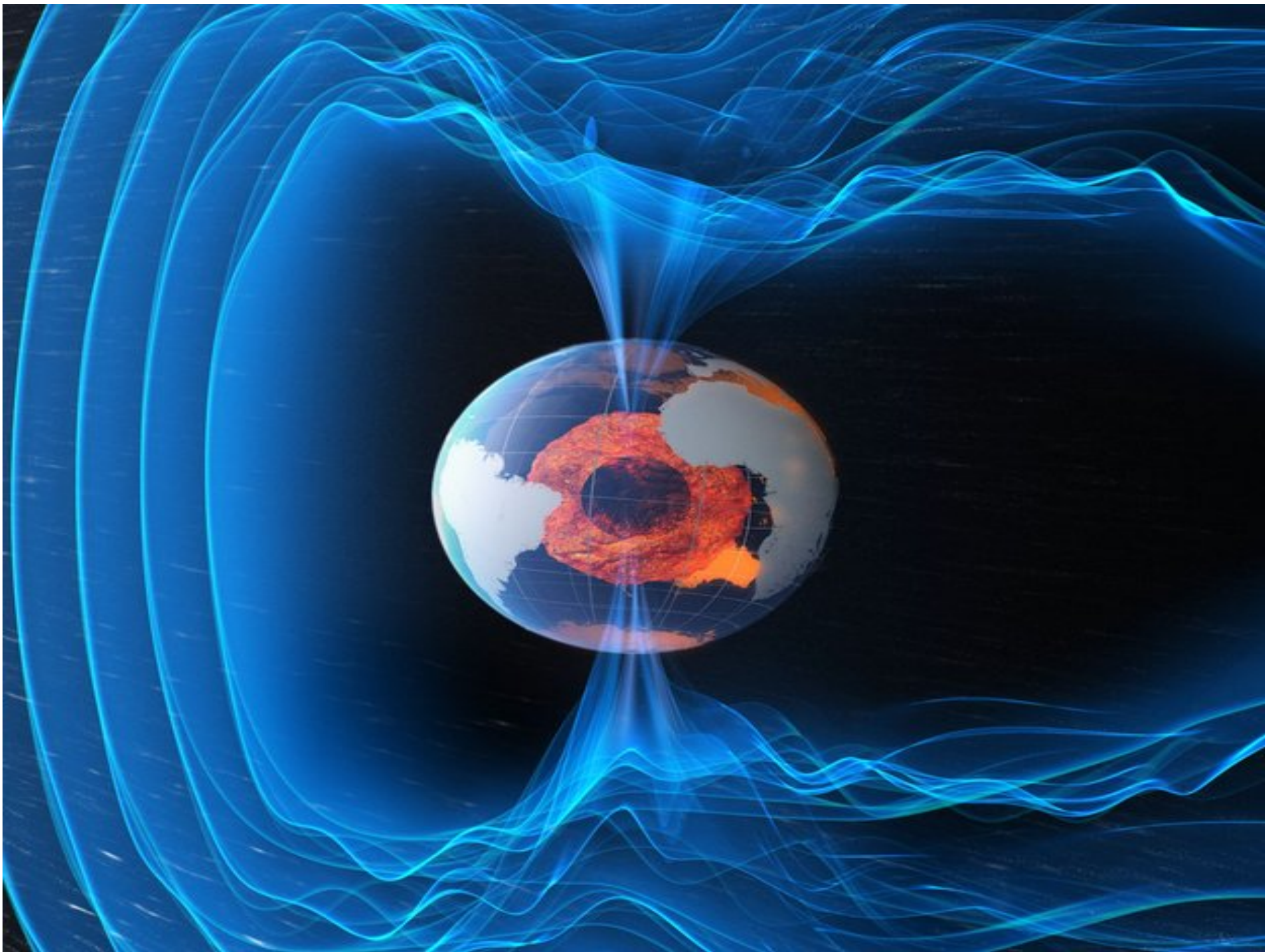
Top View



Side View



2013 Mar 14 00:00:07 UTC



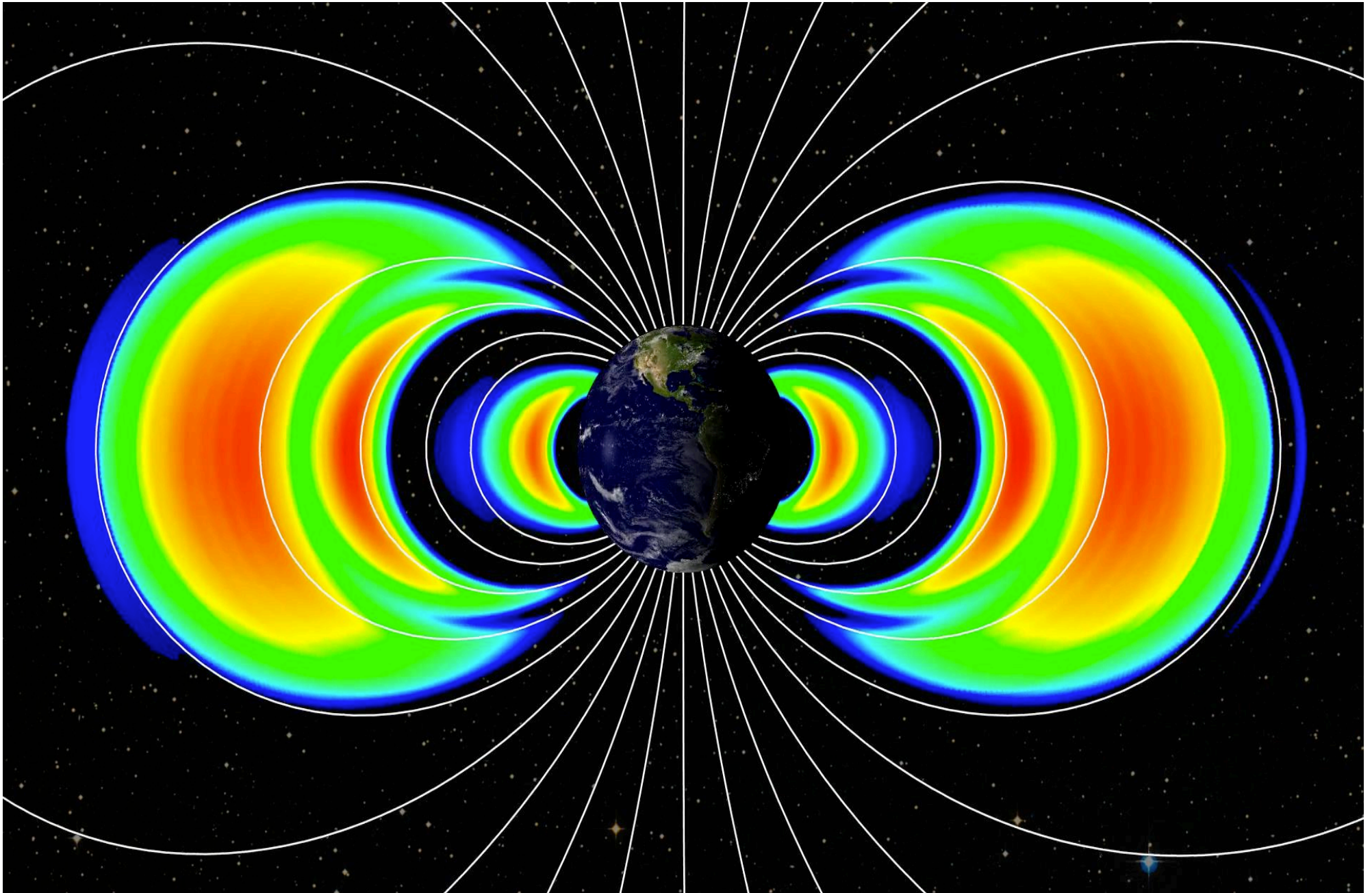
High energy particles leak down to Earth at the poles



And possibly causing geomagnetic super-storms

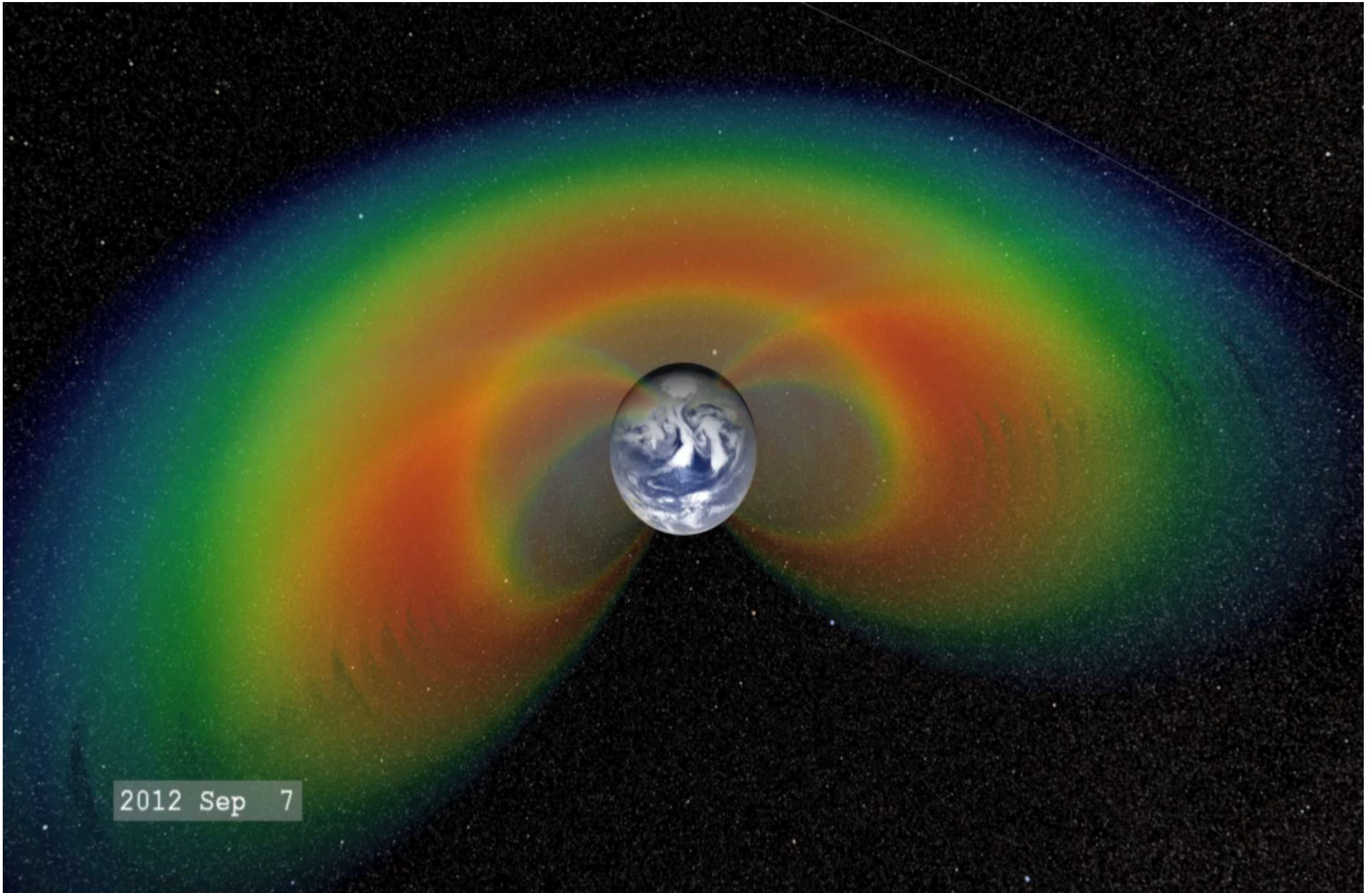


Van Allen radiation belts are trapped in the magnetosphere

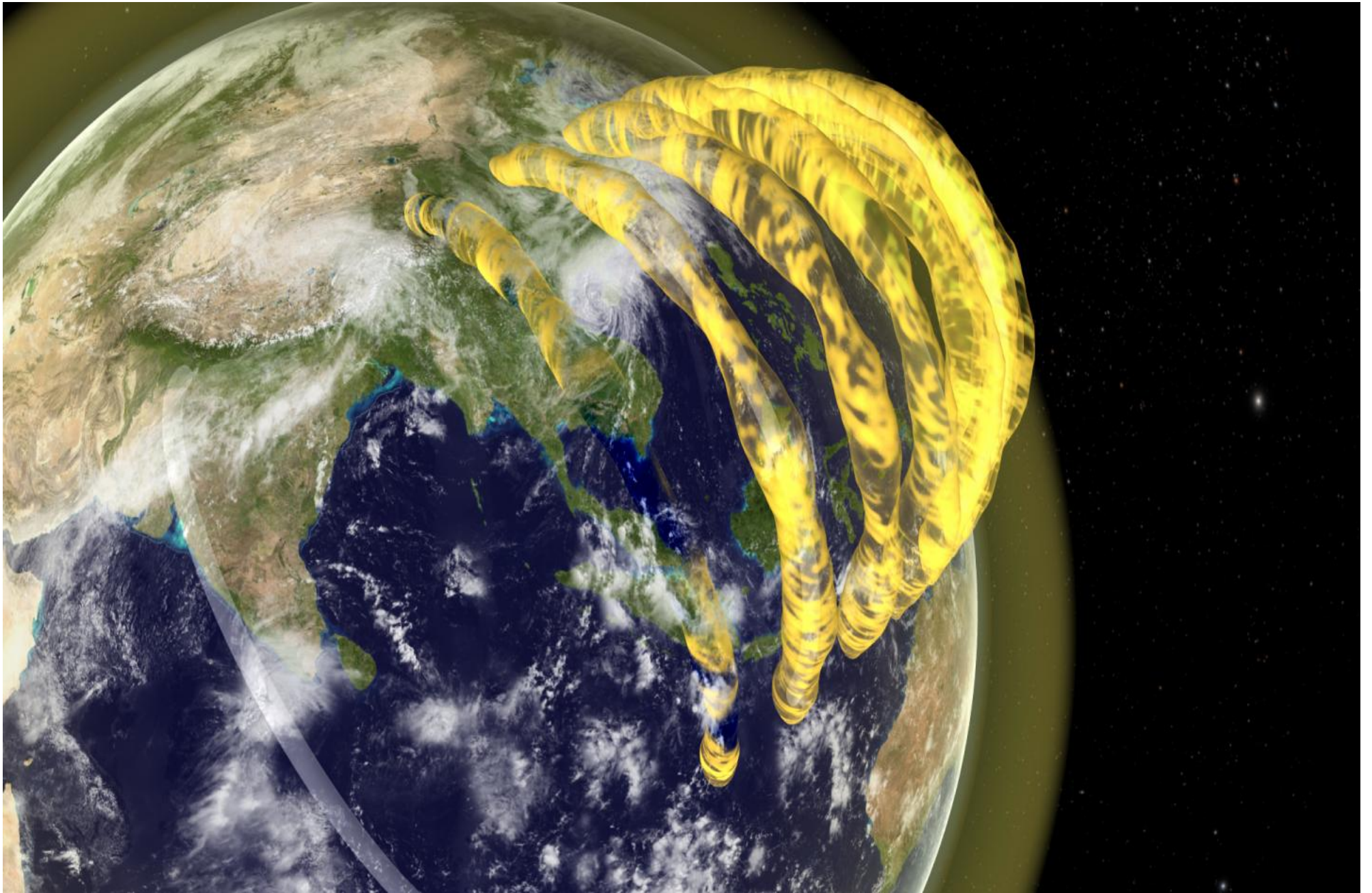




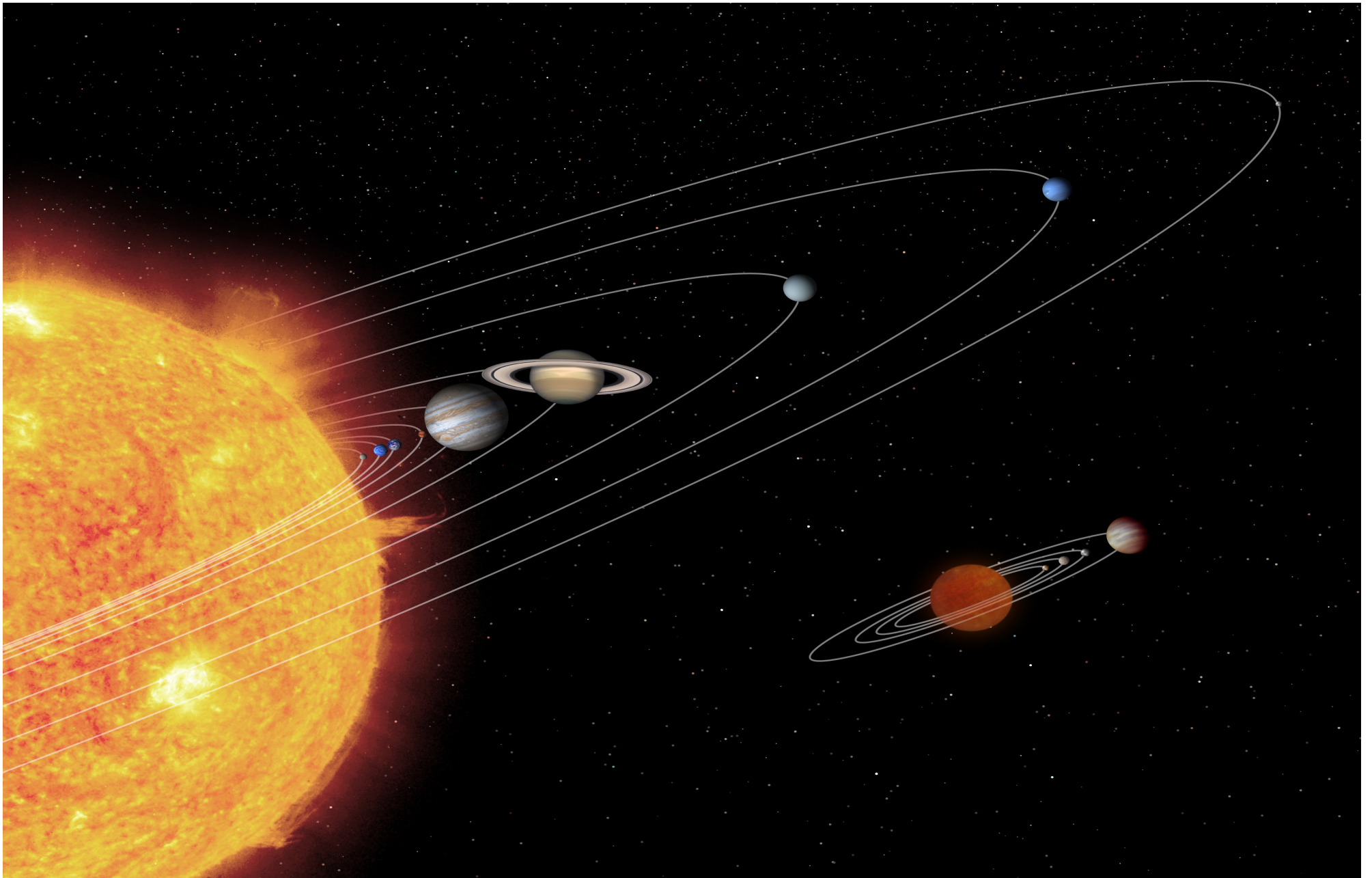
These belts are dynamic and variable



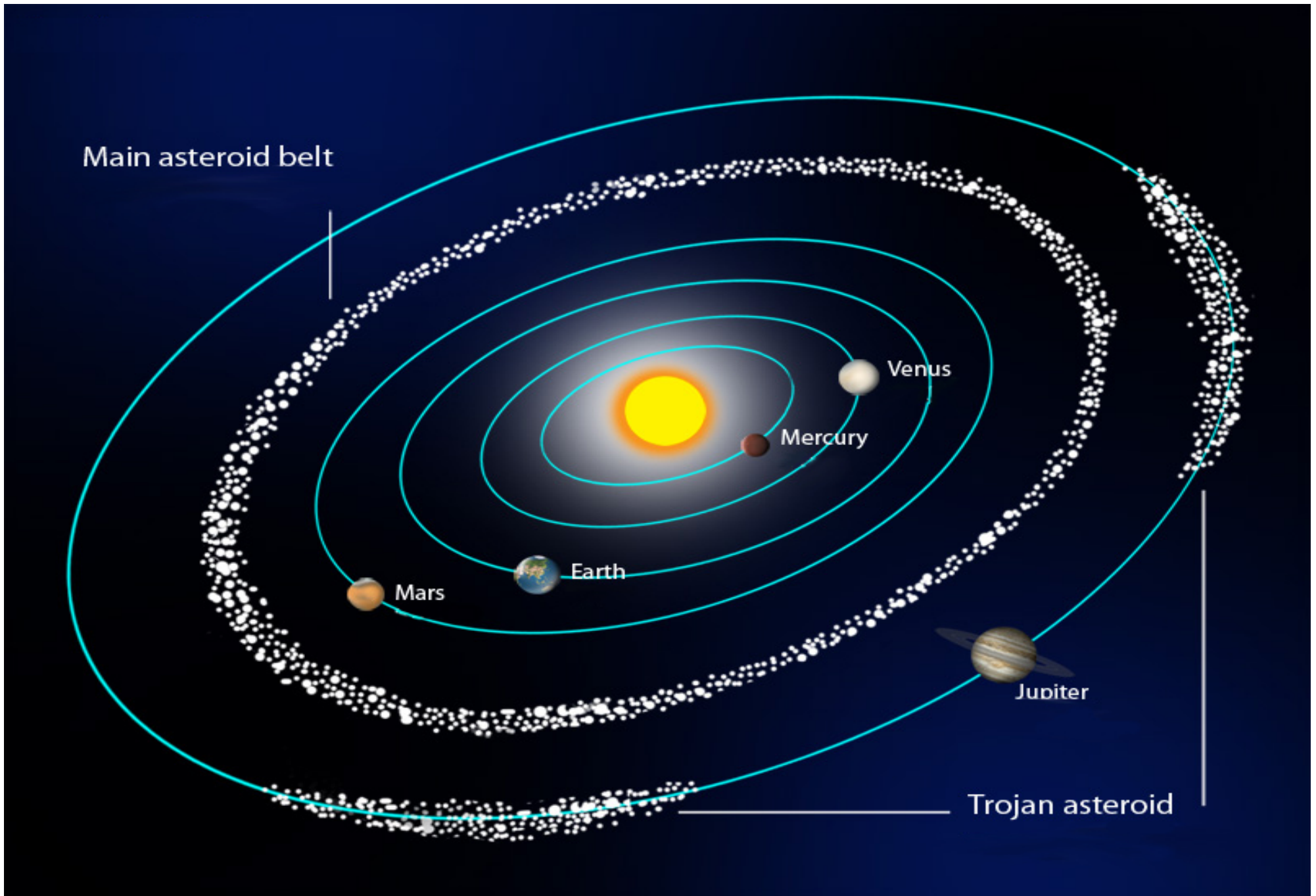
'Plasma tubes' have recently been viewed



The entire Cosmos is dynamically interconnected



# Jupiter slings asteroids from Main Belt towards Earth

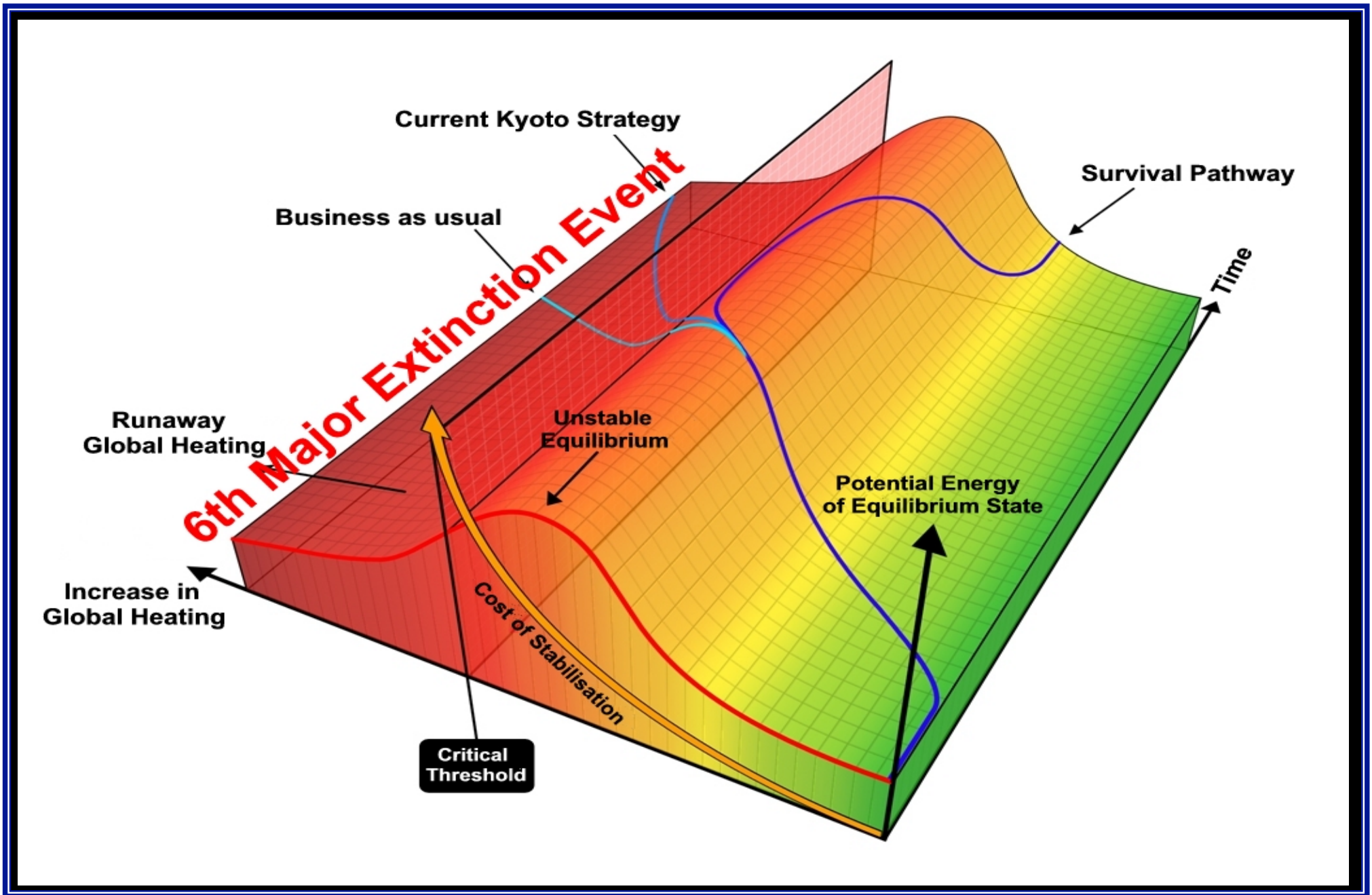


# Chelyabinsk: 1200 hospitalized as meteorite explodes

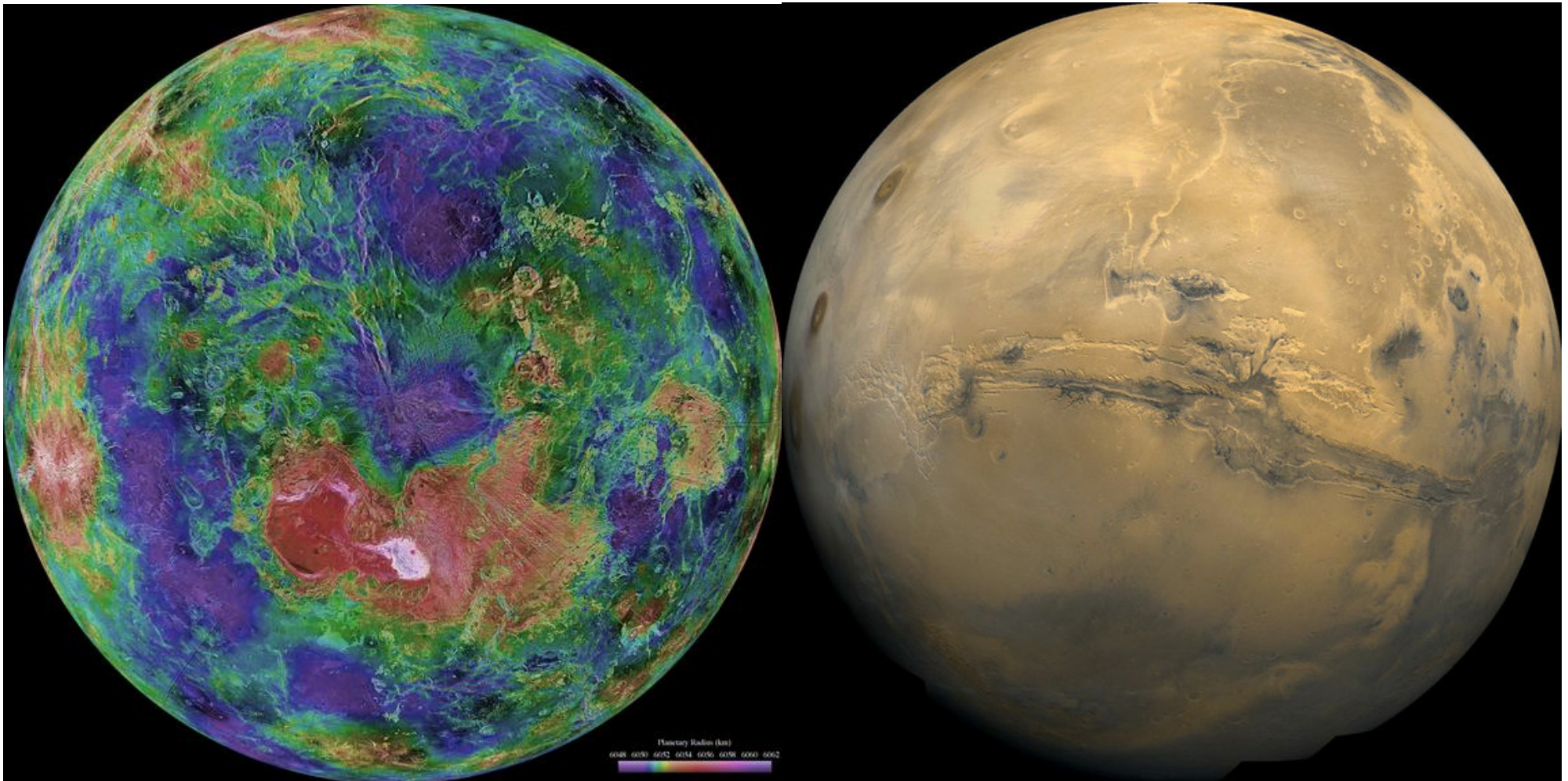




# How close are we to an extinction event?



# Could Future Earth = Venus? Mars?





# ICES – the next 5 years

- The role of ICES in space entrepreneurship
- The role of ICES as an advisory service
- The role of ICES in education

Interconnected challenges  
require  
Interconnected resources!





**Helping guide the successful transformation of human society  
in an era of complexity, rapid climate change and frequent natural disasters.**

[www.icesfoundation.org](http://www.icesfoundation.org)

# ICES has 5 main activities underway

- TEST: Global-Regional-Local planning
- ACCESS: Asian Center for Earth System Science
- CRC: Cascadia Resilience Center
- QLARM: Quake Loss Assessment for Response & Mitigation
- Space weather, space phenomena, space travel, B612