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BSV Seminar

Visual Analysis of the Evolution of Moisture Transport Patterns in the North Atlantic for different Climate Scenarios

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Introduction

- Climate change $\neq$ global temperature rising
- Moisture Transport is a very important factor in precitipation
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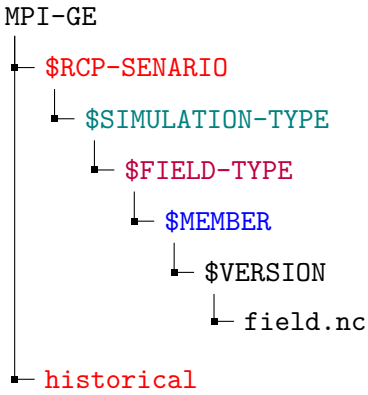
Research Questions

- How do the Patterns of Moisture Transport change in the face of various climate scenarios?

The Max Planck Institute - Grand Ensemble [4]

Quick Facts:

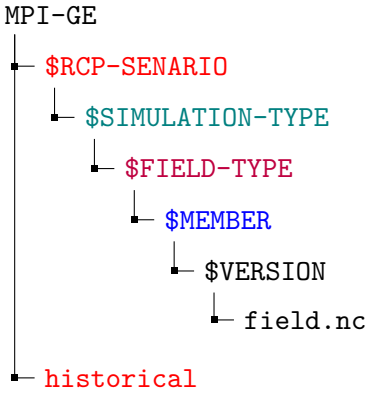
- released in 2019 [4]
- 86 Terabyte of data
- unfortunately not publicly available anymore



The Max Planck Institute - Grand Ensemble [4]

Simulation Time Scopes

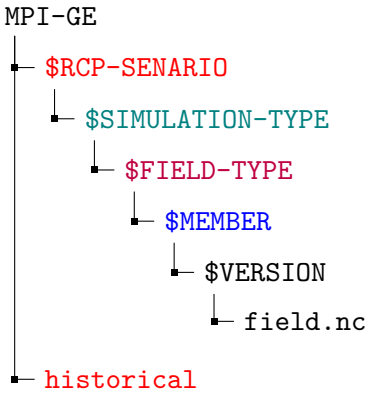
- Future simulations in the form of RCP scenarios (Representative Concentration Pathway)
- simulation from 2005-2099 (stringent pathway (rcp2.6), intermediate scenario (rcp4.5), worst case (rcp8.5))
- also a historical (1850-2005) and prehistorical (2000 years) control simulation



The Max Planck Institute - Grand Ensemble [4]

Field Types

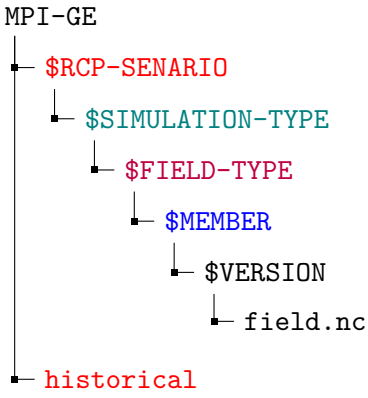
- 32 different fields for the atmosphere
- Resolution: Lat/Long: $1.875°$, Time: monthly averages, Vertical: 26 Levels from 10 to 100000 Pa
- Examples: evaporation, preciptation, horizontal wind speed, specific humidity



The Max Planck Institute - Grand Ensemble [4]

Simulation Models

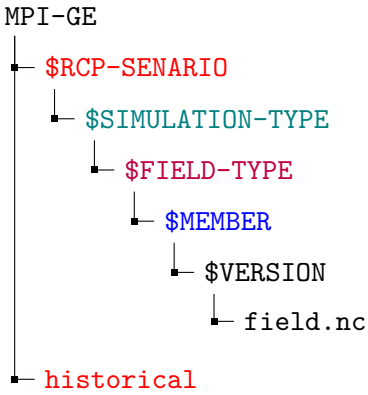
- different simulation models for different areas: land, ocean, atmosphere …
- my focus: atmospheric parts



The Max Planck Institute - Grand Ensemble [4]

Simulation Members

- 100 Members per field → 100 different simulations
- tries to catch the chaotic nature of climate



Moisture Transport

1. Vapor Integration
   - Integrated Water Vapor (IWV)
   - Integrated Water Vapor Transport (IVT) [1–3, 5–8]
   - Moisture Budgets
2. Langrangian Model
3. stable oxygen isotope investigation

Pattern Analysis with EOF

- FOr those familiar: its basically PCA
- or to be more specific:
-

Challanges of visualizing uncertain Fields

- 100 Ensemble Members $\rightarrow$ 100 different results

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3. Z. Jiang et al., en, Journal of Geophysical Research: Atmospheres 122, 600–613 (2017).
4. N. Maher et al., en, Journal of Advances in Modeling Earth Systems 11, 2050–2069 (2019).
5. F. M. Ralph et al., en, Journal of Hydrometeorology 18, 2577–2596 (2017).
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