South American Monsoon Sensitivity to External Forcings

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NEPARS REU lightning talk

UNIVERSITY AT ALBANY
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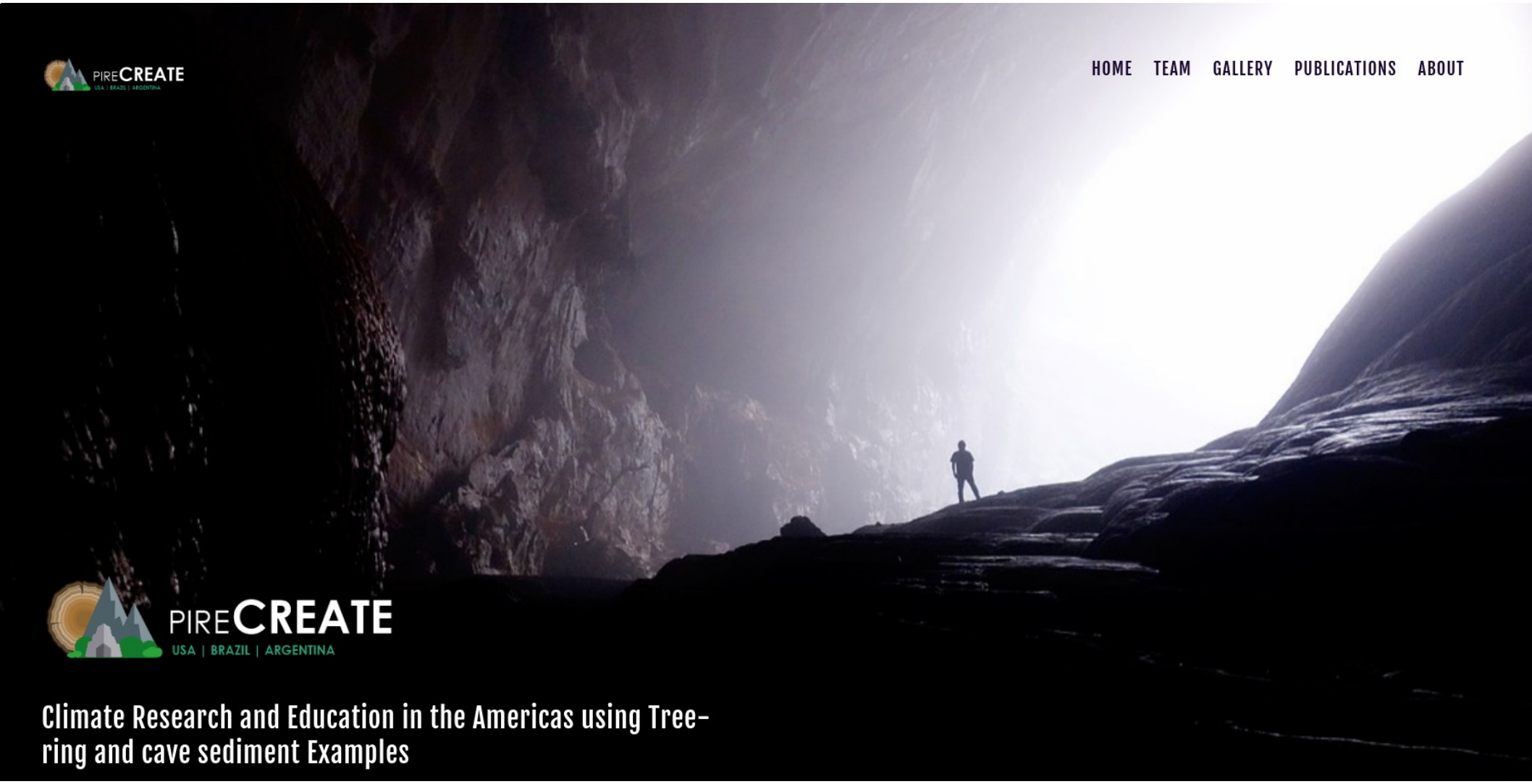

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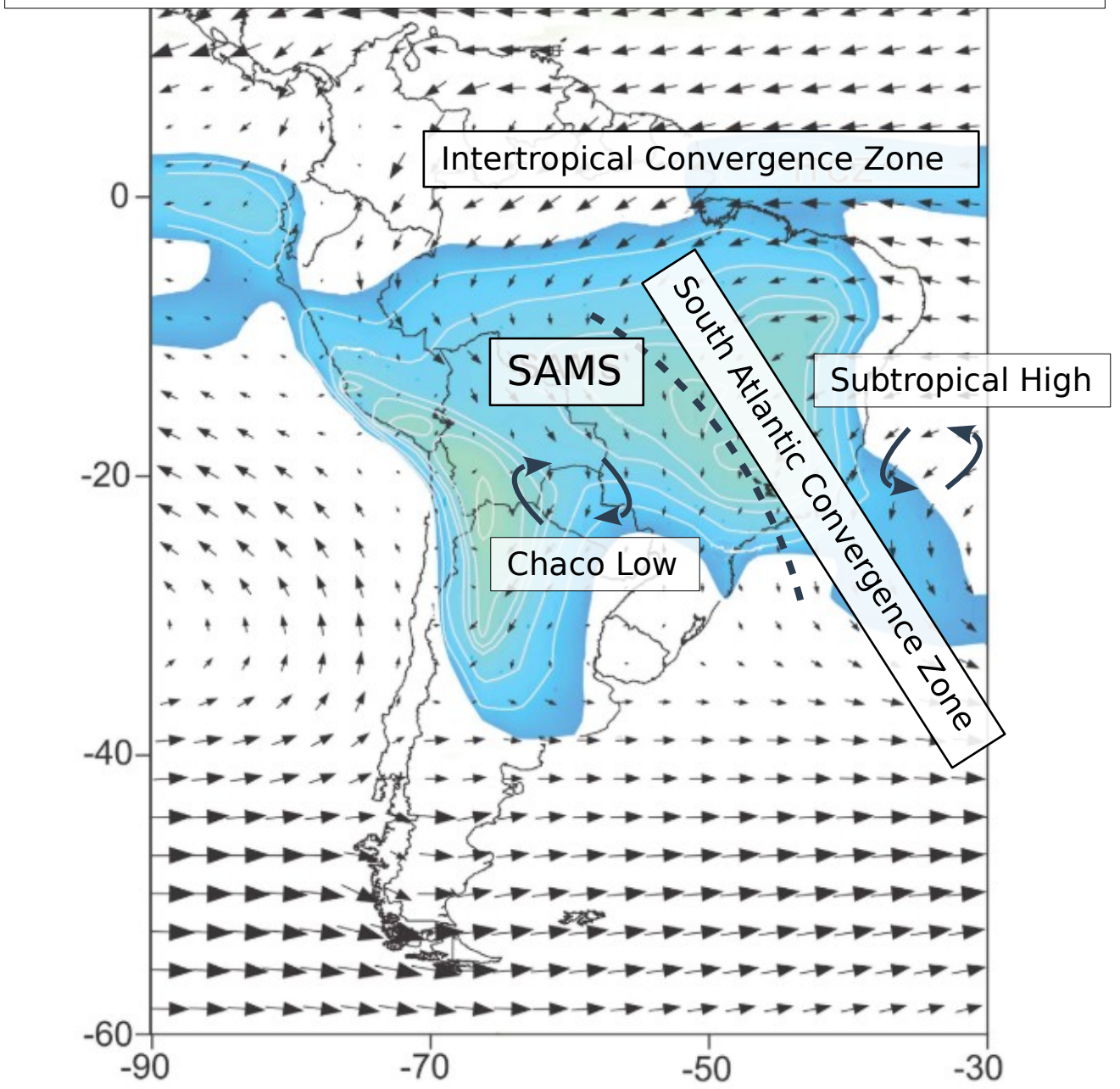
South American Monsoon System



850 hPa wind field

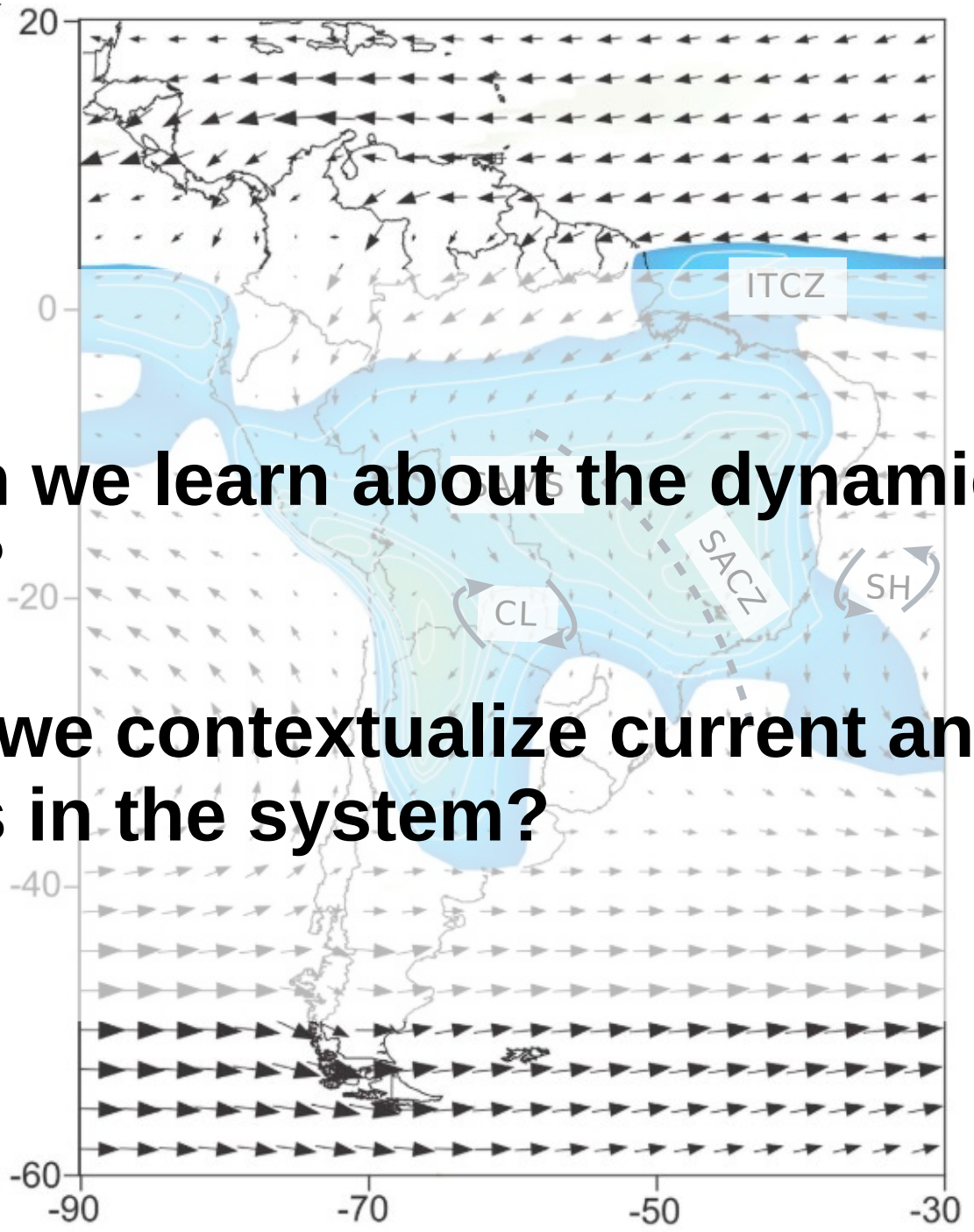
16 m/s

Fraction of DJF precipitation

0.3 0.4 0.5 0.6 0.7 0.8

Adapted from Novello et al., 2016

- **How can we learn about the dynamics of this system?**
- **How do we contextualize current and future changes in the system?**



850 hPa wind field — 16 m/s

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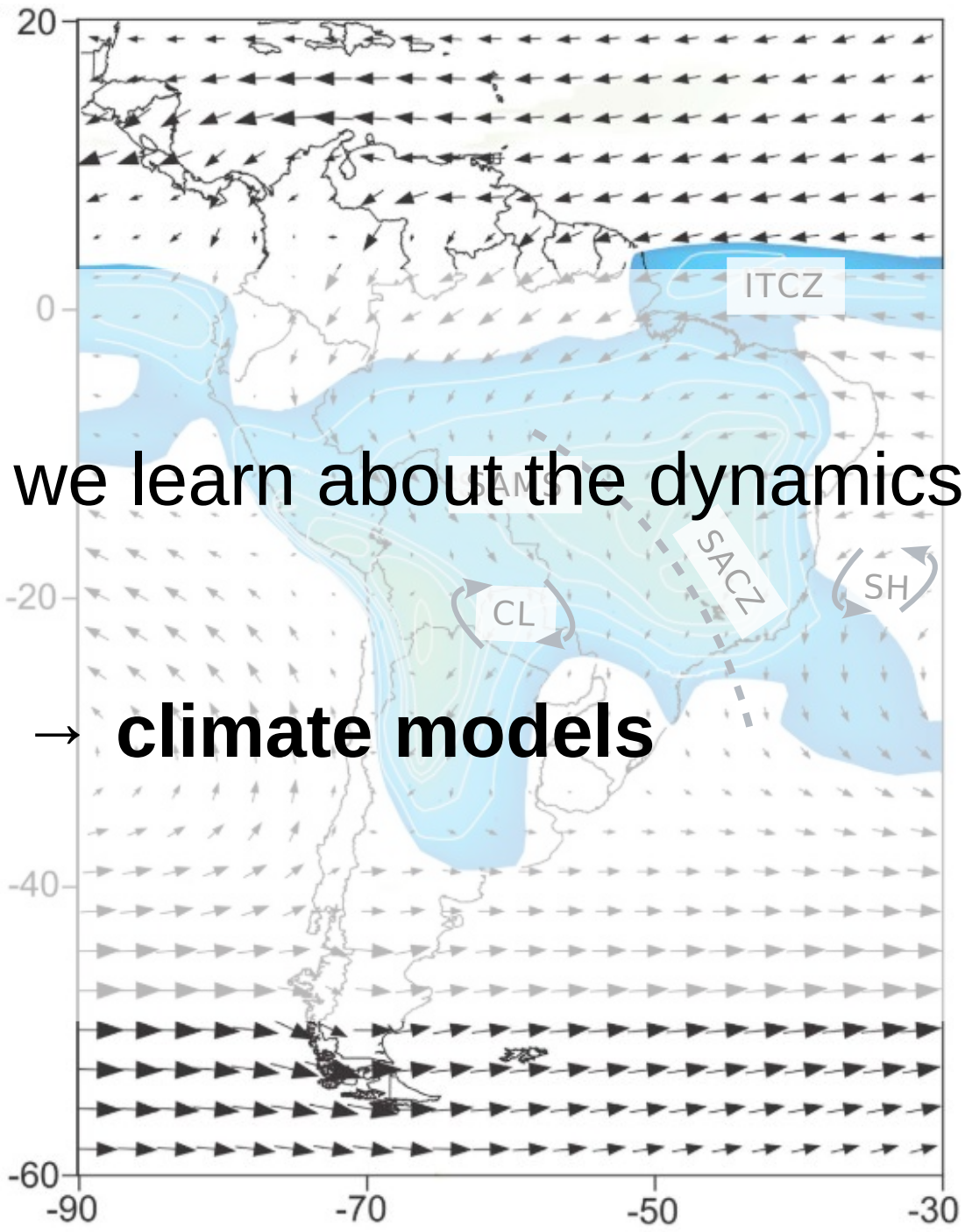
Adapted from Novello et al., 2016

- How can we learn about the dynamics of this system?

→ **climate models**



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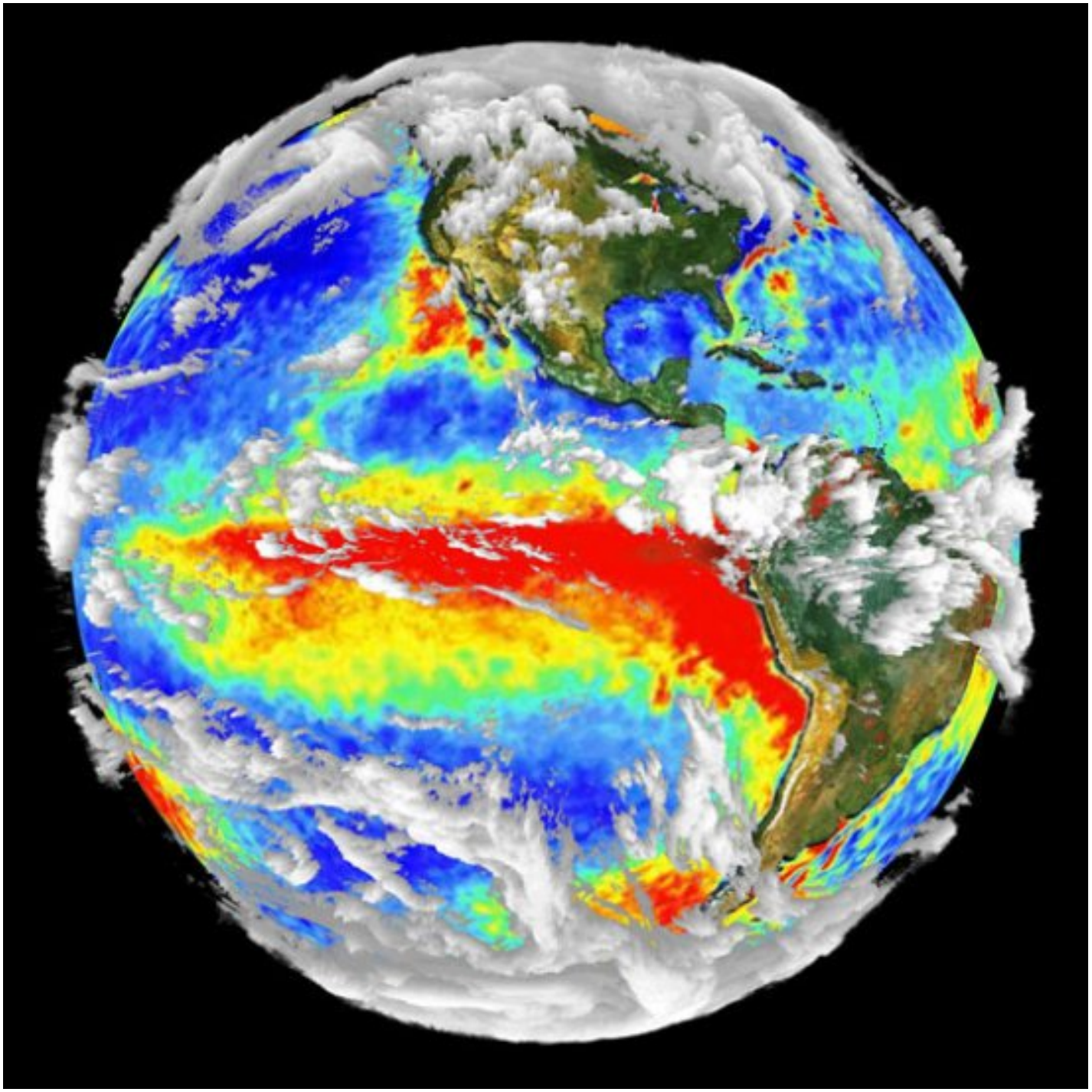
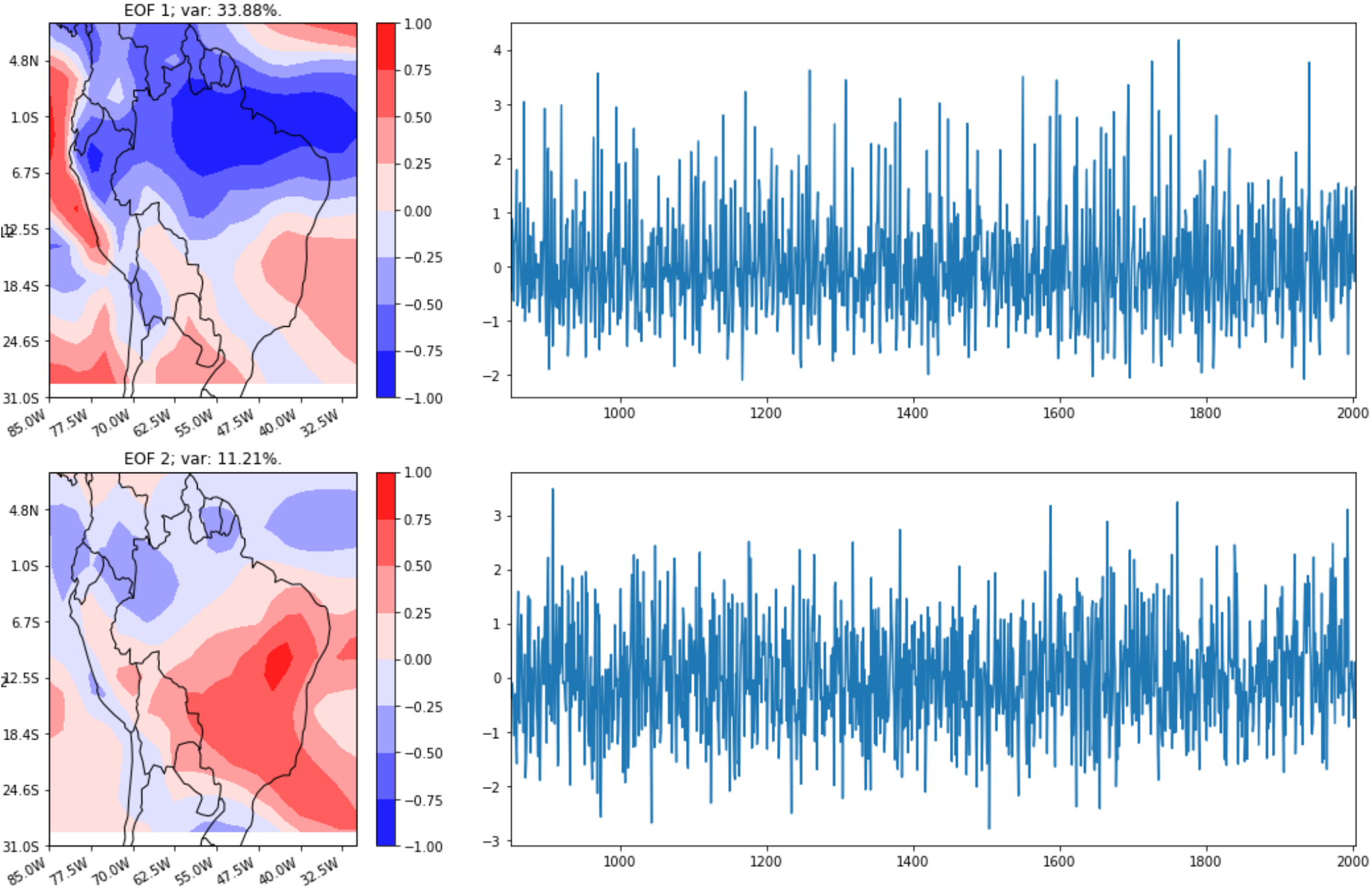
Novello et al., 2016



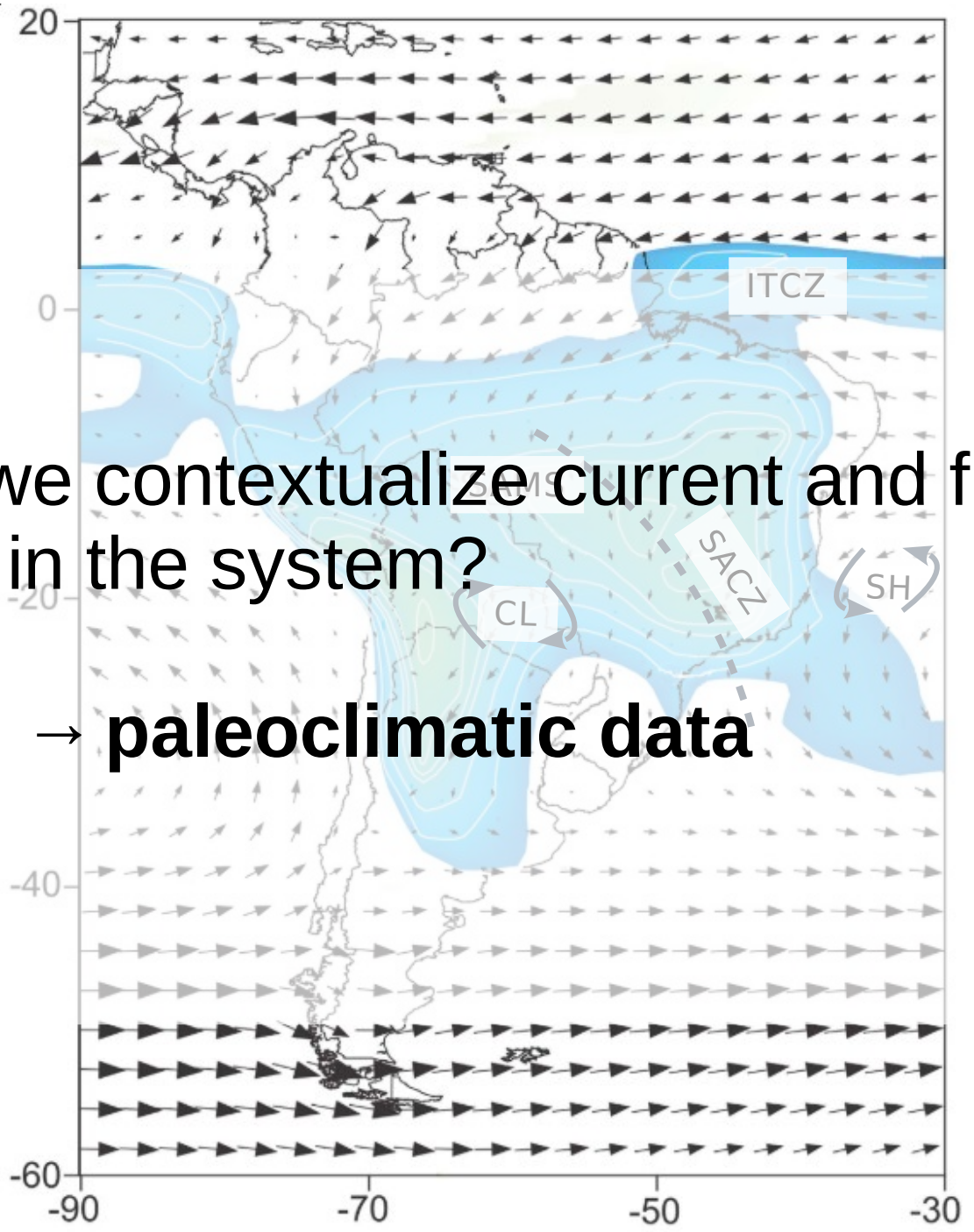
NASA

Precipitation [CESM-LME; full forcing]



- How do we contextualize current and future changes in the system?

→ **paleoclimatic data**



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Fraction of DJF precipitation

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Adapted from Novello et al., 2016

Proxy Records
Palestina Cave
Paraíso Cave
Diva de Maura Cave, Torrinha Cave, Lapa Doce Cave
Laguna Pumacocha
Pau d'Alho Cave, Curupira Cave
Huagapo Cave
São Bernardo Cave, São Matheus Cave
Quelccaya Ice Cap
Jaraguá Cave
Tamboril Cave
Parque Nacional Torotoro
Cristal Cave
Venezuela
Bogotá
Colombia
Guyana
French Guiana
Suriname
Quito
Ecuador
STATE OF RORAIMA
STATE OF AMAPÁ
STATE OF AMAZONAS
STATE OF PARÁ
STATE OF MARANHÃO
STATE OF CEARÁ
STATE OF PIAUÍ
STATE OF PARAÍBA
Brazil
STATE OF ACRE
STATE OF RONDÔNIA
STATE OF TOCANTINS
STATE OF ALAGOAS
Lima District
STATE OF MATO GROSSO
Salvador
STATE OF GOIÁS
Bolivia
STATE OF MINAS GERAIS
Belo Horizonte
STATE OF MATO GROSSO DO SUL
STATE OF SÃO PAULO
STATE OF RIO DE JANEIRO
Paraguay
Asunción
São Paulo
STATE OF PARANÁ
Chile
STATE OF SANTA CATARINA
STATE OF RIO GRANDE DO SUL
Córdoba
Uruguay
Santiago
Buenos Aires
Argentina
Montevideo

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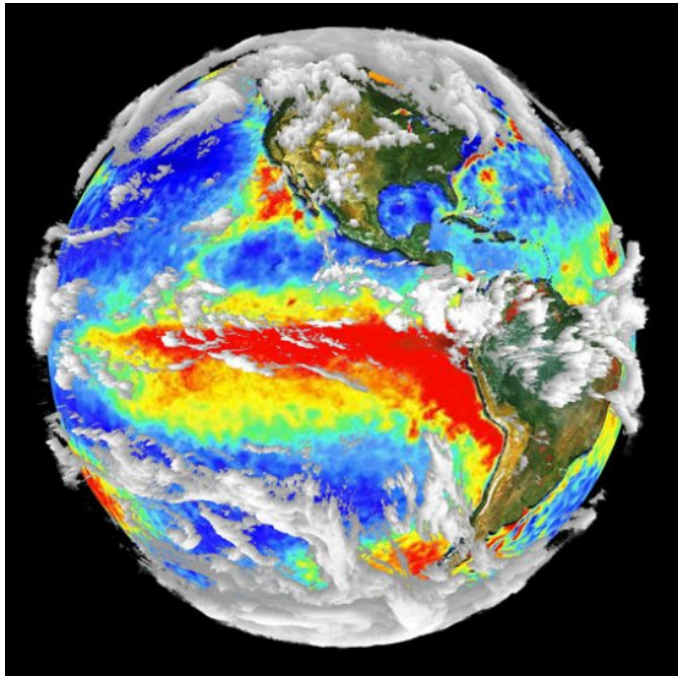
Summary:

Understanding the system contextualized by the past...



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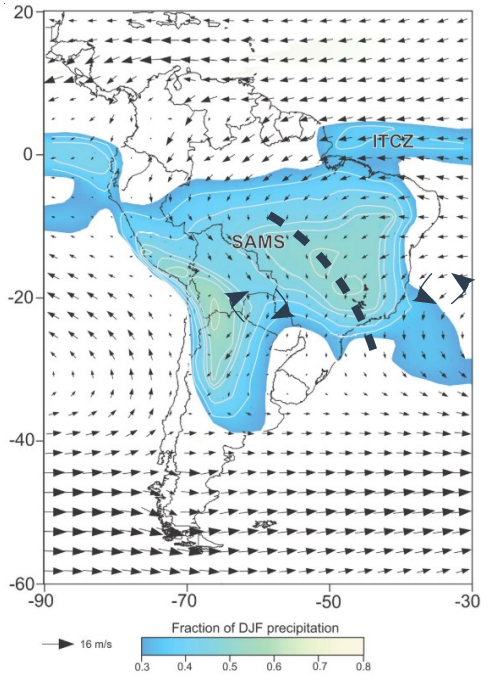
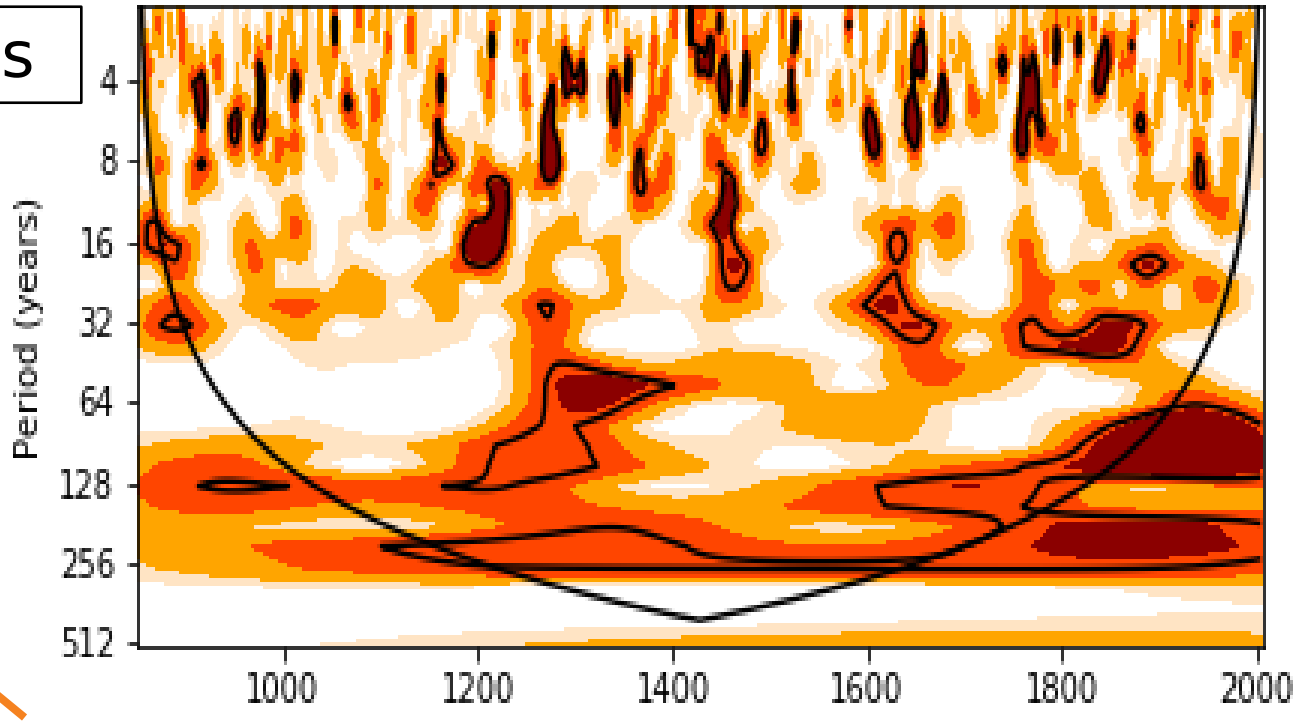


...we look to the future

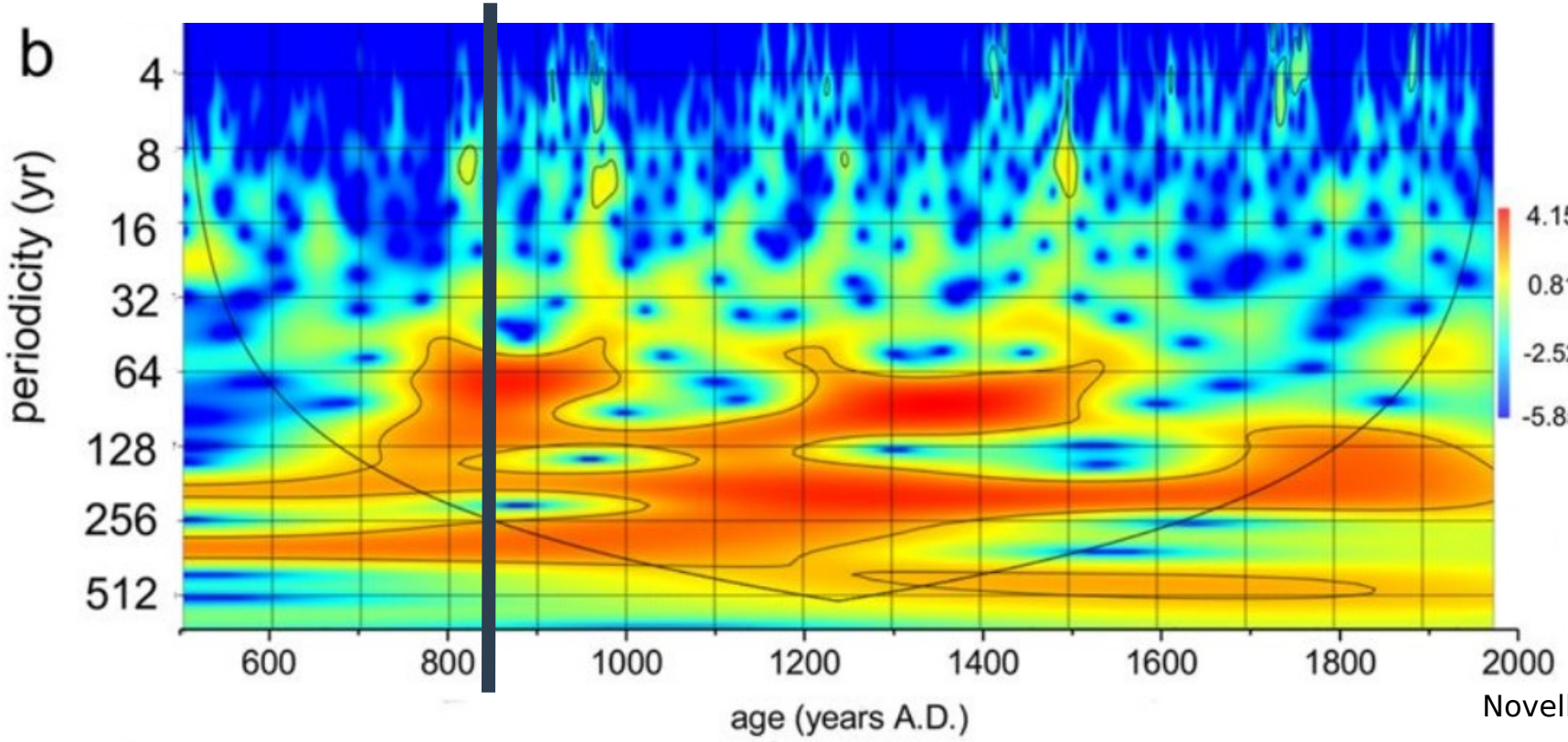
Thank you!

Questions?

Wavelet Analysis



Full SAM domain



Pau D'Alho + Curupira

(~15S, ~56W)

Novello et al., 2016

Last Millennium Ensemble details:

- Greenhouse gases: transient 850 – 2005 [3] (Schmidt et al. 2011)
- Land cover/land use: transient 850 – 2005 [3] (Pongratz et al. 2008, Hurtt et al. 2011)
- Ozone-Aerosols: transient 1850 – 2005 [2] (Schmidt et al. 2011)
- Solar Insolation: transient 850 – 2005 [4] (Vieira et al. 2011)
- Orbital: transient 850 – 2005 [3] (Berger 1978)
- Volcanic eruptions: transient 850 – 2005 [5] (Gao et al., 2008)

- Unless noted, other forcings in single forced runs set to fixed 850 values, ozone-aerosols fixed at 1850 levels. No volcanic forcing outside volcanic forced run.