Towards impact-relevant climate projections: the challenge of internal variability

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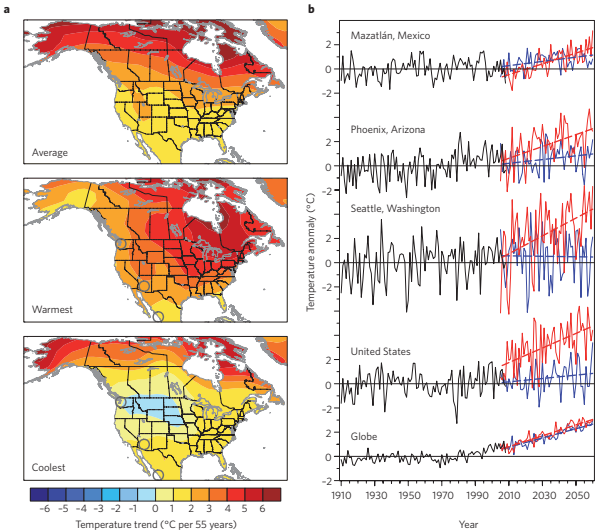
ETH zürich

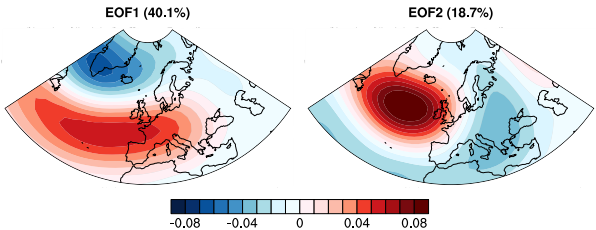


Range of future climate outcomes. a, December–January–February (DJF) temperature trends during 2005–2060. **b**, DJF temperature anomaly time series.

(after Deser et. al, 2012)

Dynamical adjustment

Remove the component of temperature variability that is attributable to atmospheric circulation.



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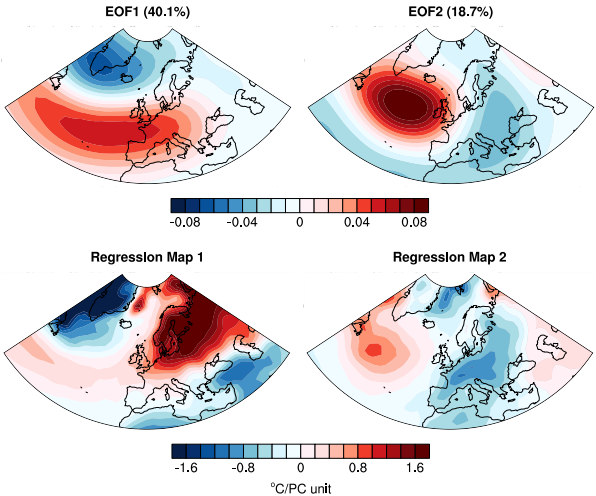

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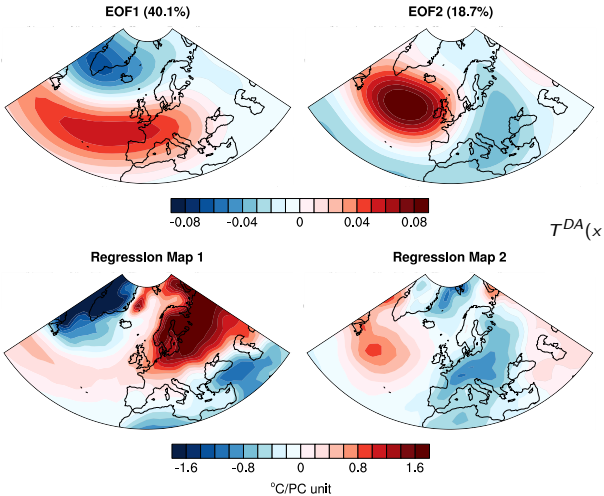
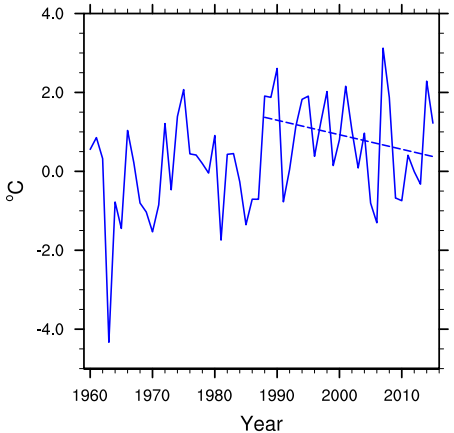


$$T^{DA}(x,y,t) = T(x,y,t) - \sum_{i=1}^{N} R_i(x,y) \cdot PC_i(t)$$

Winter (DJF) temperature trends over Switzerland (°C/decade)

Period	(°C/decade)
1960-2015	0.25
1988-2015	-0.37



Winter (DJF) temperature trends over Switzerland (°C/decade)

Period	(°C/decade)
1960-2015	0.25
1988-2015	-0.37
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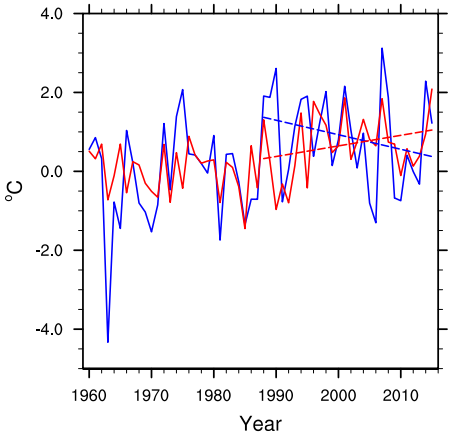
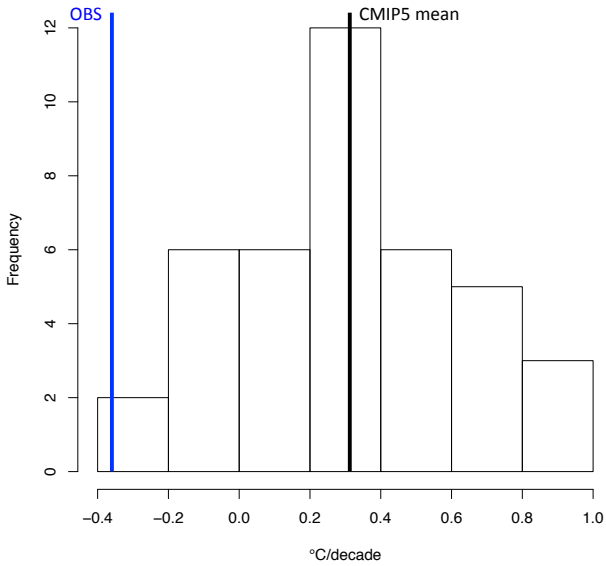


Observed vs. CMIP5 1988-2015 DJF temperature trends over Switzerland



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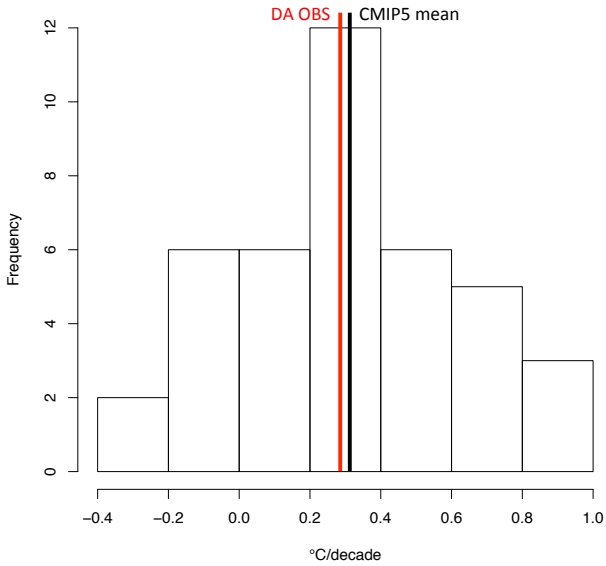
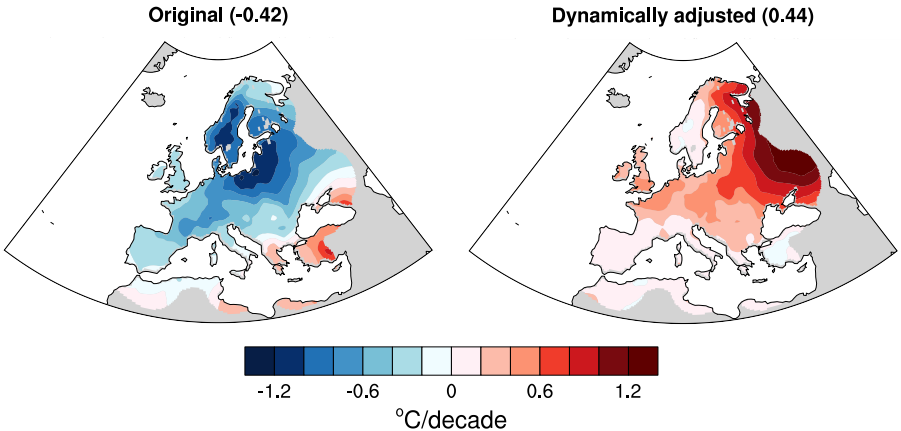


1988-2012 DJF mean temperature trends (°C/decade)



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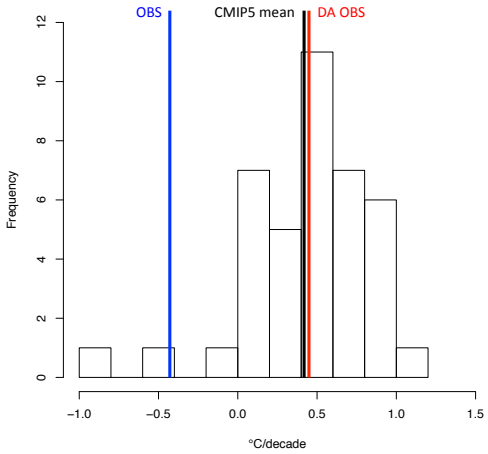
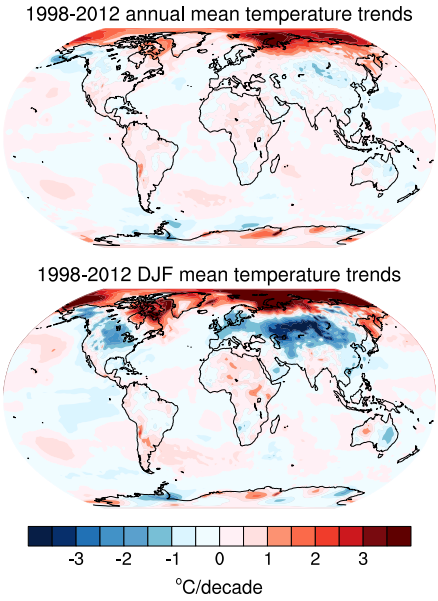


The global warming hiatus

Cooling in the Northern Hemisphere winter, especially over land, and warming elsewhere and in the other seasons.

(Cohen et al., 2012)

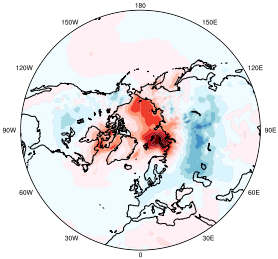


The global warming hiatus

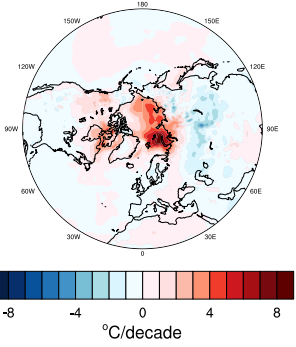
- Atmospheric circulation.
- Coverage bias
  i.e. missing observations.

(Saffioti et al., 2015)

1998-2012 DJF - Original temp. trends



1998-2012 DJF - Dynamically adjusted temp. trends



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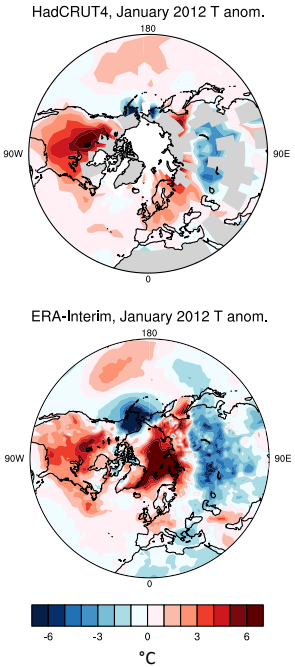

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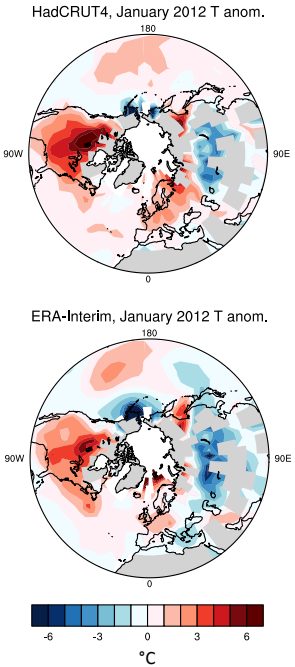

To what extent is atmospheric circulation affected by anthropogenic forcing?

Conclusions

(i) Estimation of the anthropogenic contribution to past trends.

(ii) Comparison between models and observations.

(iii) Accounting for both circulation and coverage bias allows to reconcile the hiatus temperature trends with the long-term trends.

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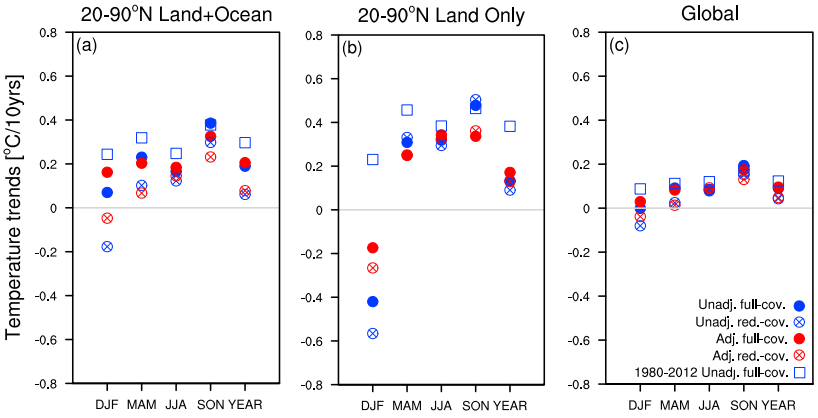
Thank you for your attention


20-90°N Land+Ocean
20-90°N Land Only
Global
(a)
(b)
(c)
Temperature trends [°C/10yrs]
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
DJF MAM JJA SON YEAR
Unadj. full-cov.
Unadj. red.-cov.
Adj. full-cov.
Adj. red.-cov.
1980-2012 Unadj. full-cov.