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Quantifying the evolution of agriculture impact on climate in Europe by regional climate model simulations

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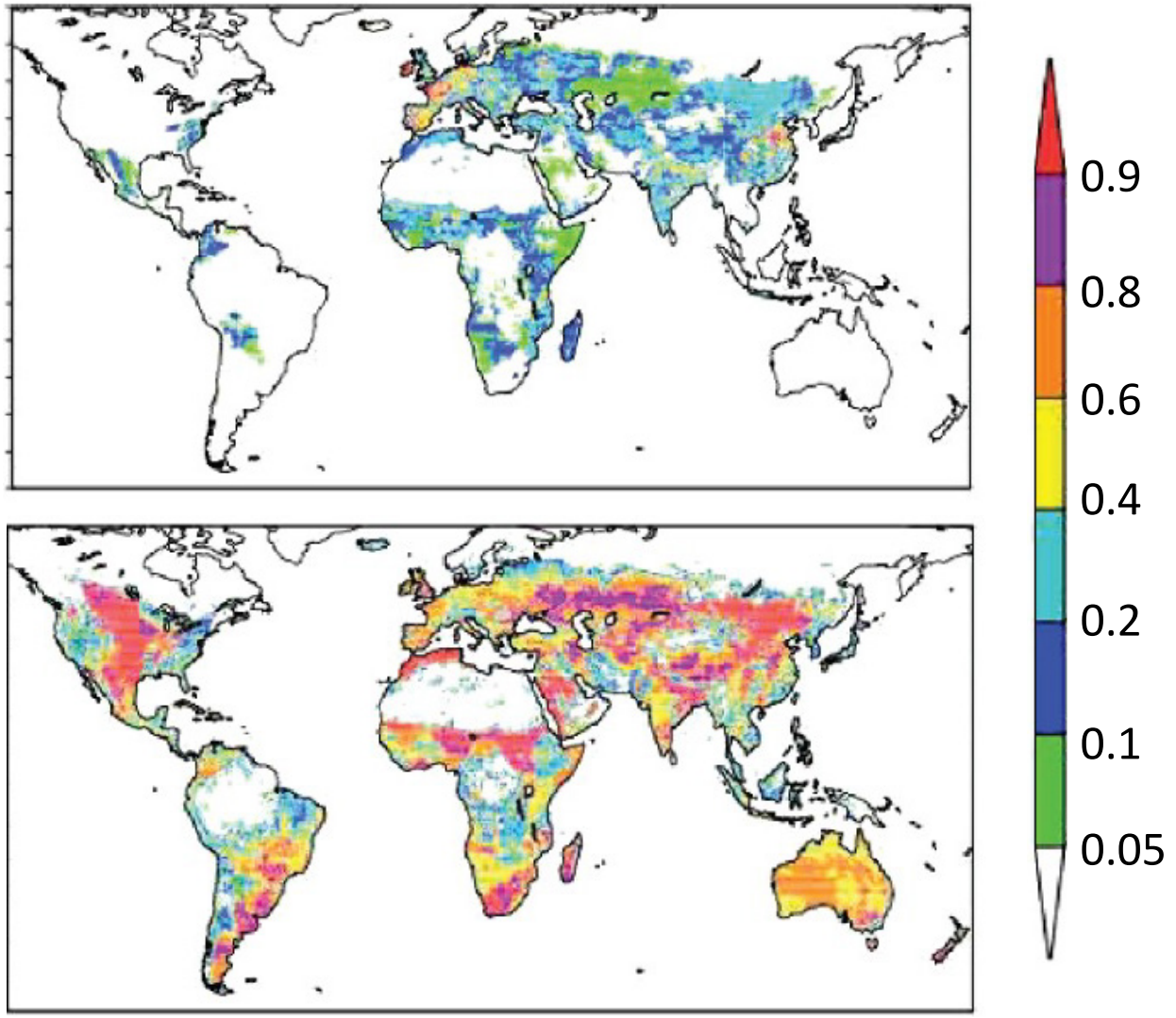
Pasture/crop lands change from 1800 to 2000

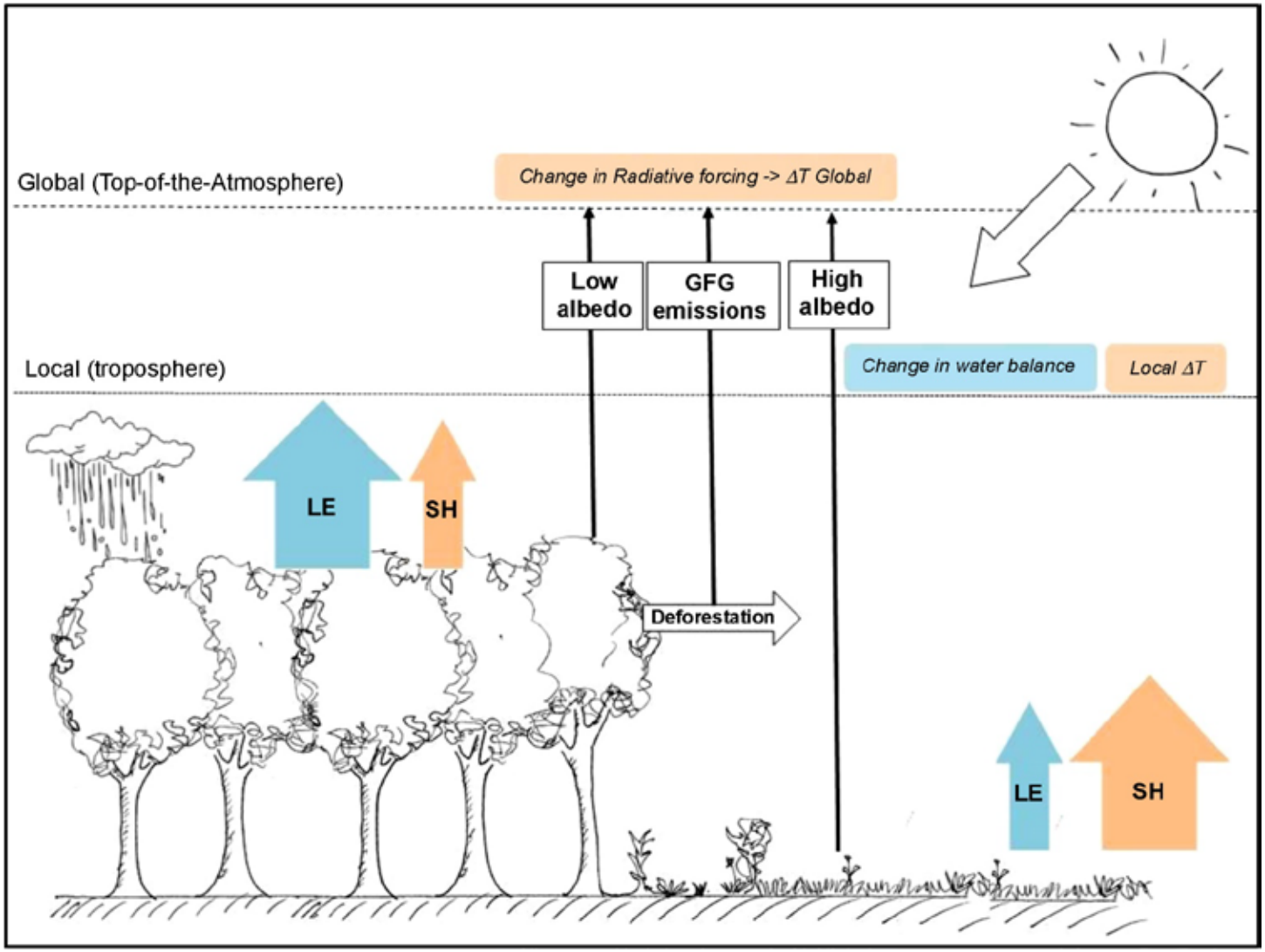
1800

2000



Pielke et al., *WIREs Clim Change* 2011; Mahmood et al., *Int J Climatol* 2014

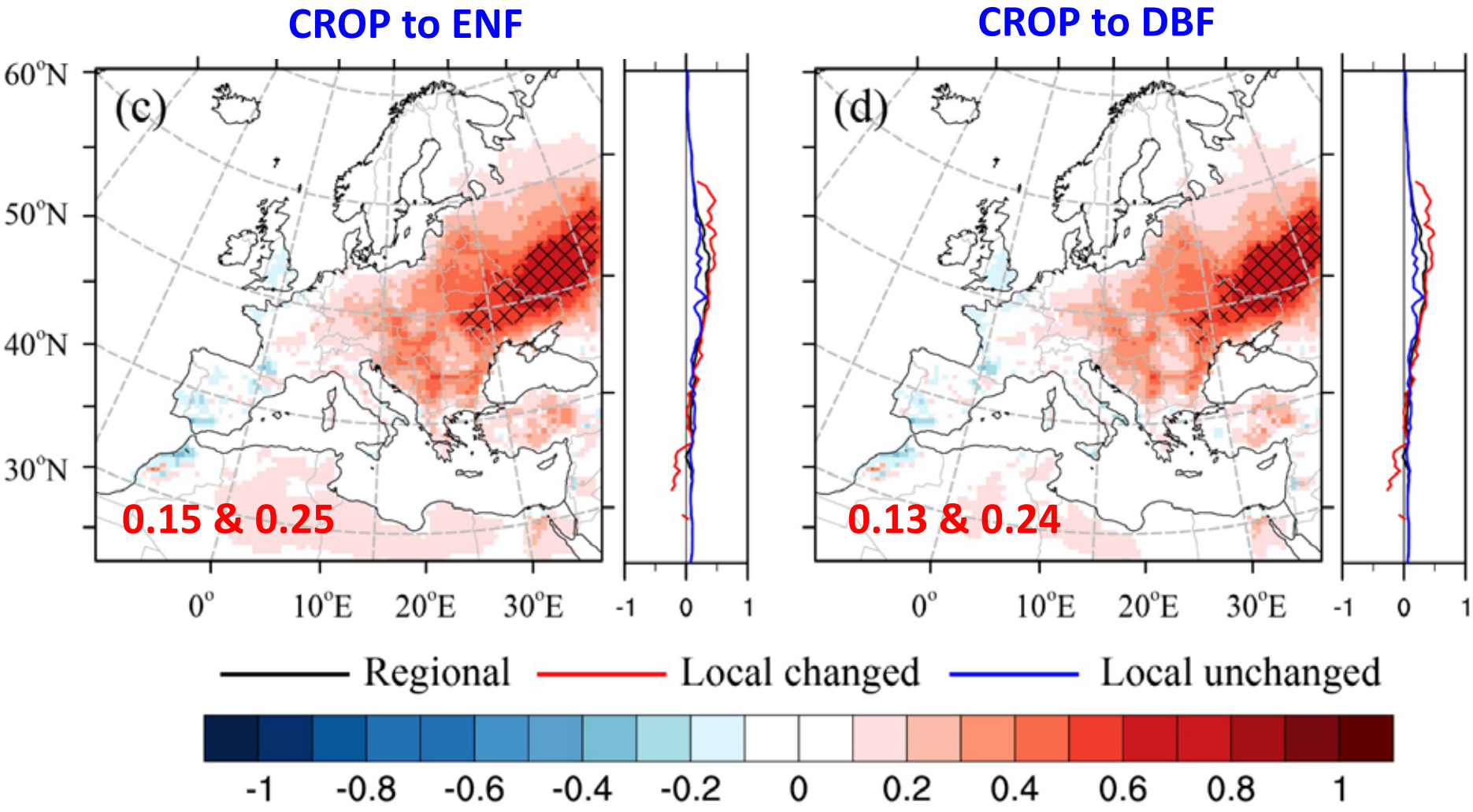
Biophysical and biogeochemical effects of land cover change



LE: Latent heat; SH: Sensible heat

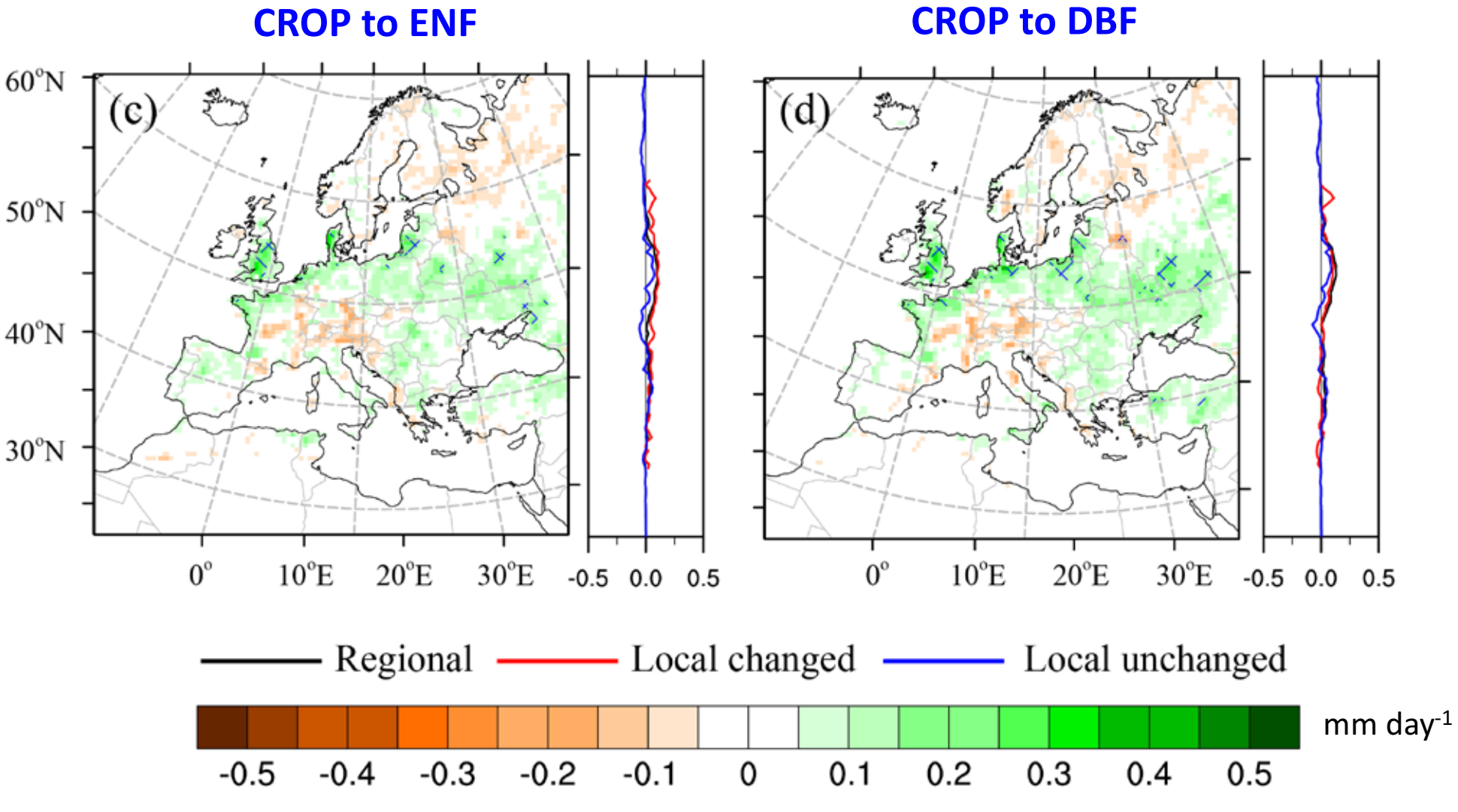
Perugini et al, 2017

Warming Europe by Cropland reduction



Cherubini et al., 2018 ERL

Annual mean precipitation changes

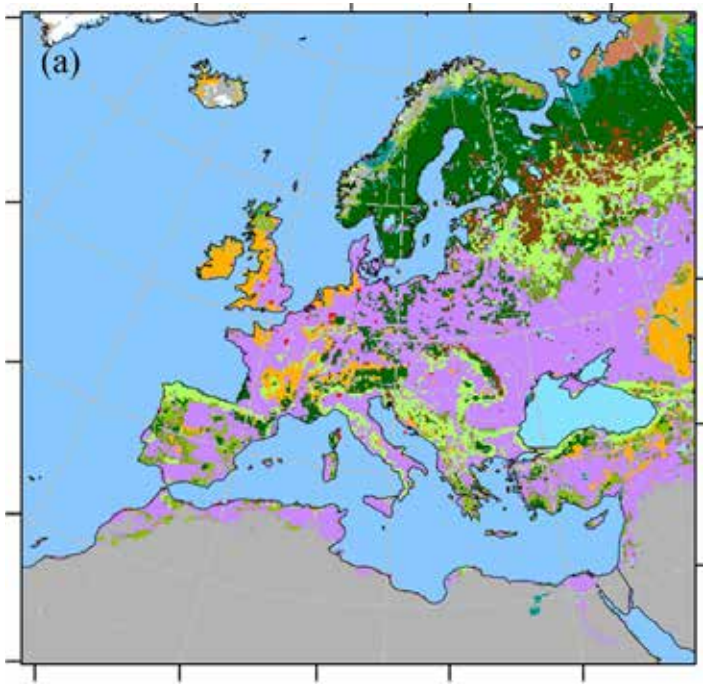


Cherubini et al., 2018 ERL

Data and model simulations

➢ **Data**

- European Space Agency (ESA) Climate Change Initiatiue (CCI) land cover 2015
- E-OBS observation
- Duveiller et al., 2018 *Sci Data*

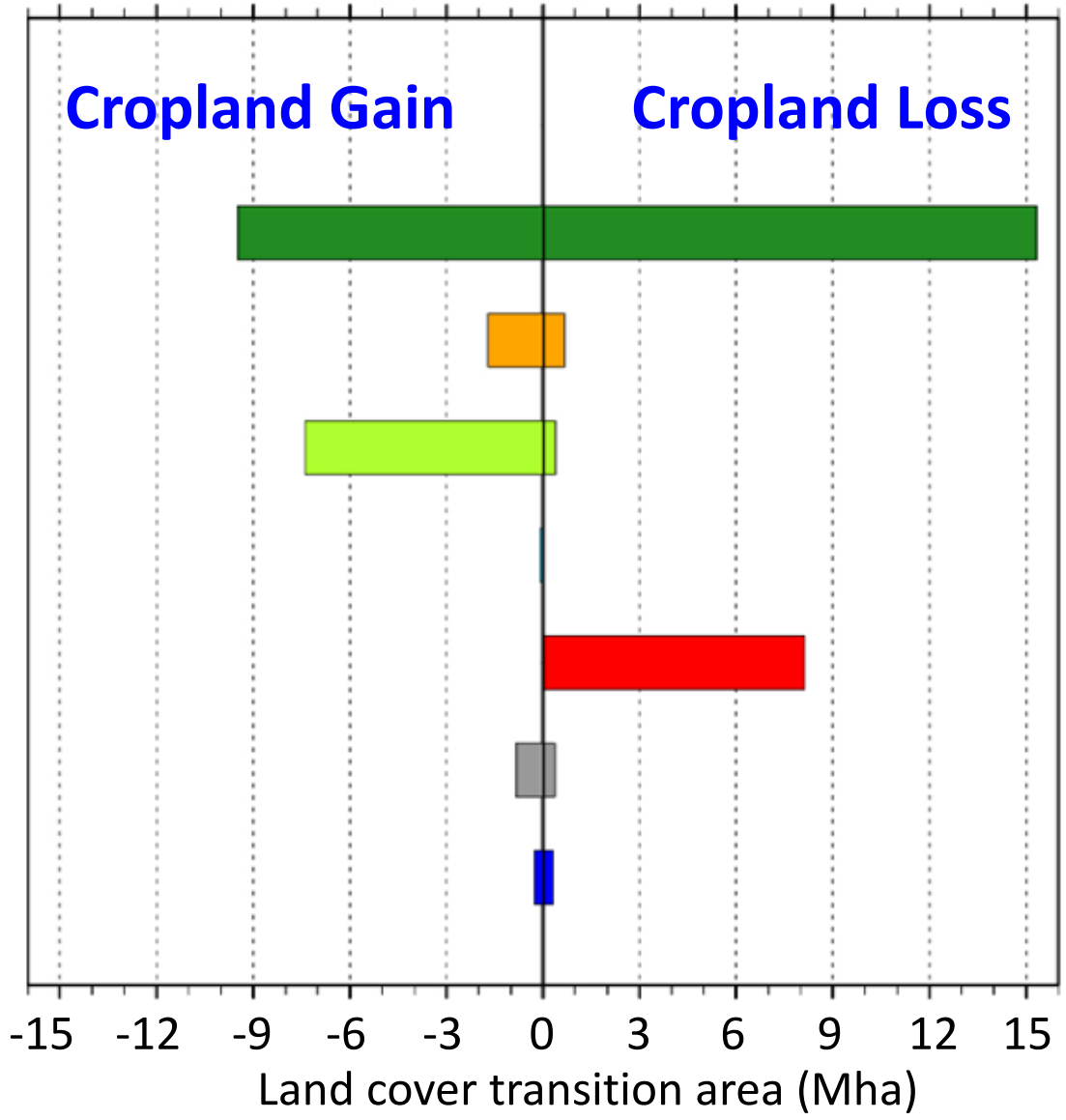


➢ **Model simulation**

- WRF v3.9.1
- Driven data: ERA-Interim
- Horizontal resolution: 0.11° (~12km)
- Three simulations:
  - ➢ Land cover 1992 (LCI),
  - ➢ Land cover 2015 (LCII), and
  - ➢ No Cropland abandonment (LCIII)

➢ **Decomposition method**

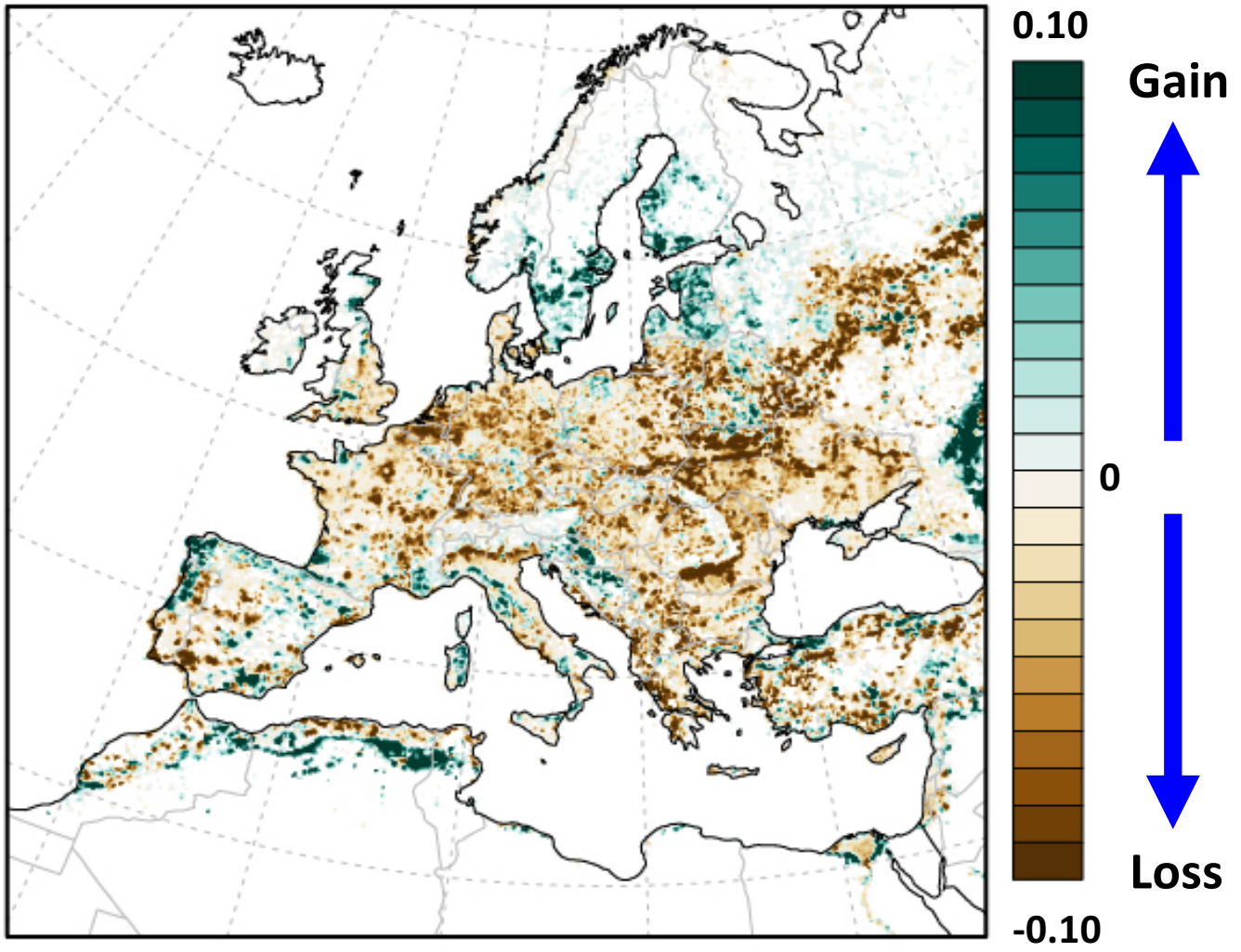
Agriculture area transition in Europe



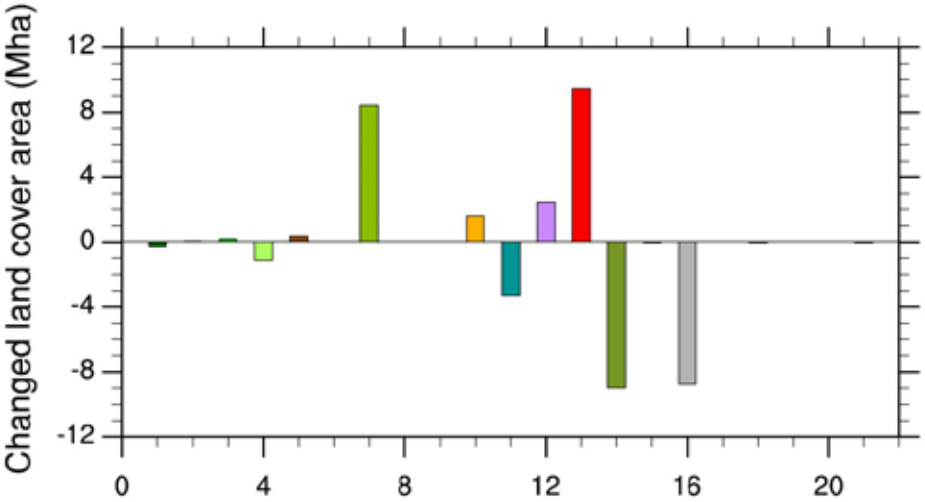
LC2015 – LC1992
Gain: 19.8 Mha
Loss: 25.2 Mha
Net: -5.4 Mha

- AGR: Agriculture
- FOR: Forest
- GRA: Grassland
- SV: Sparse Vegetation
- WET: Wetland
- SET: Settlement
- BAR: Bare areas
- WAT: Water

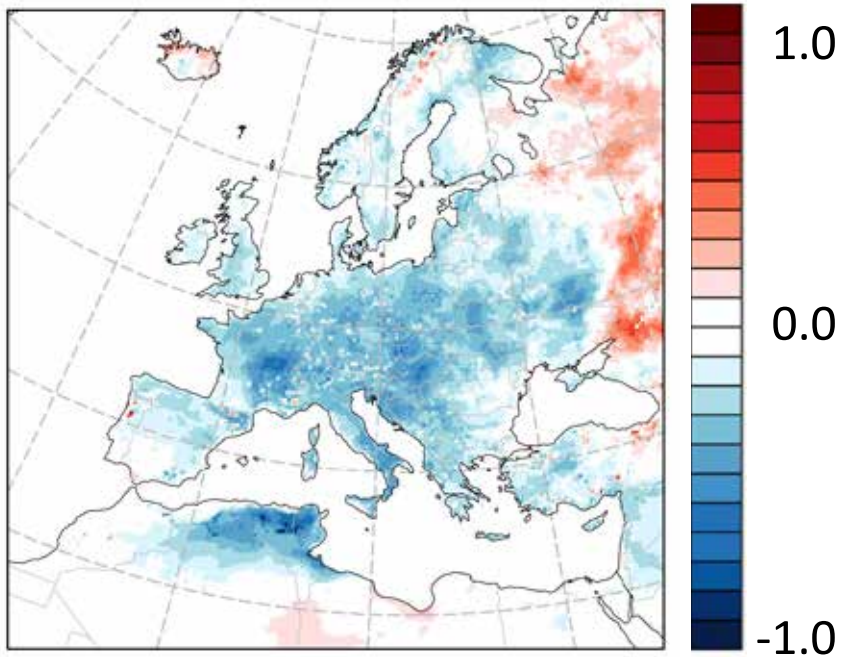
Cropland change from 1992 to 2015

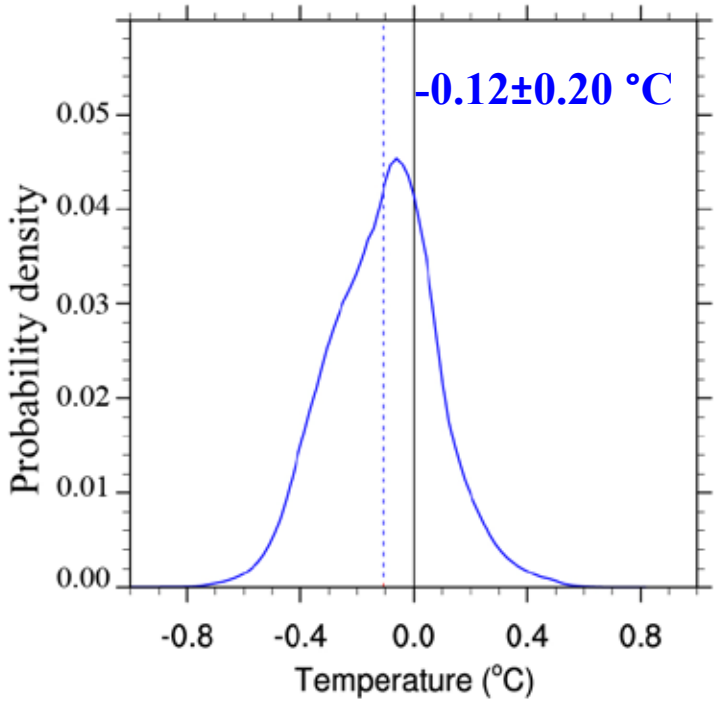


Climate change due to land cover change



Temperature

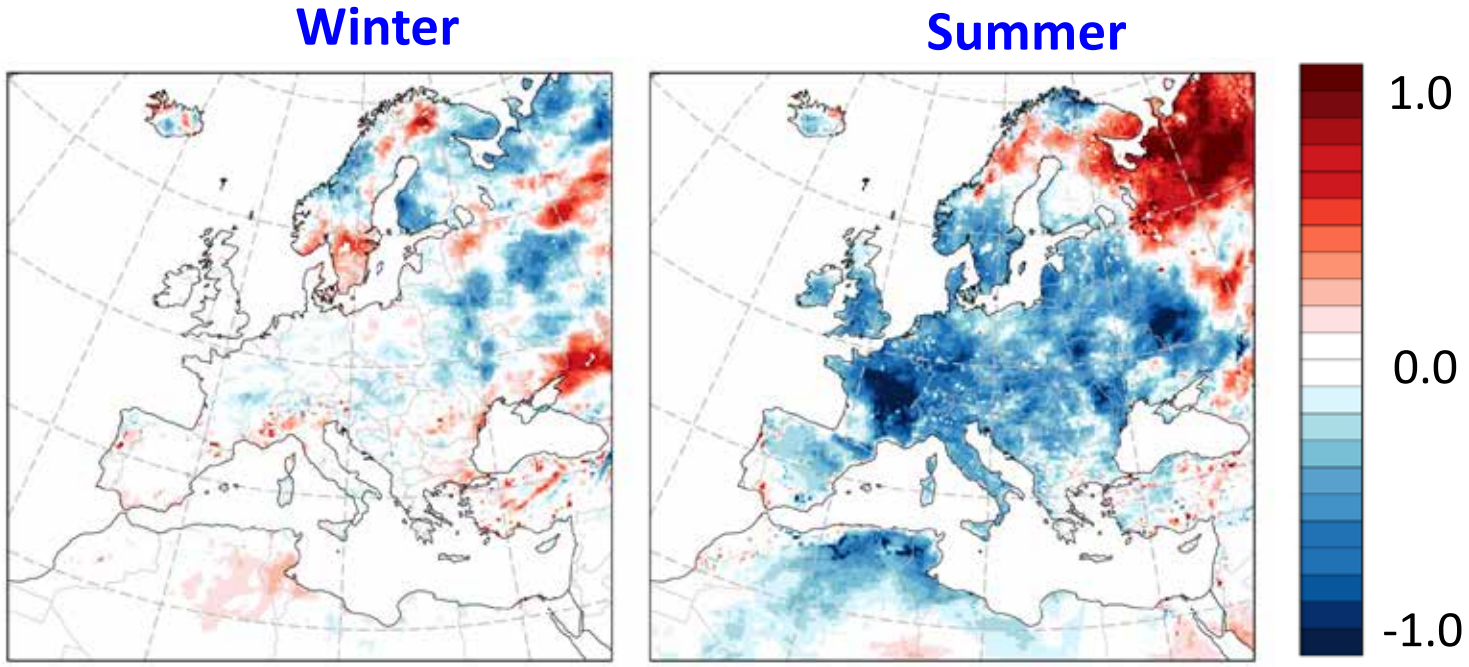


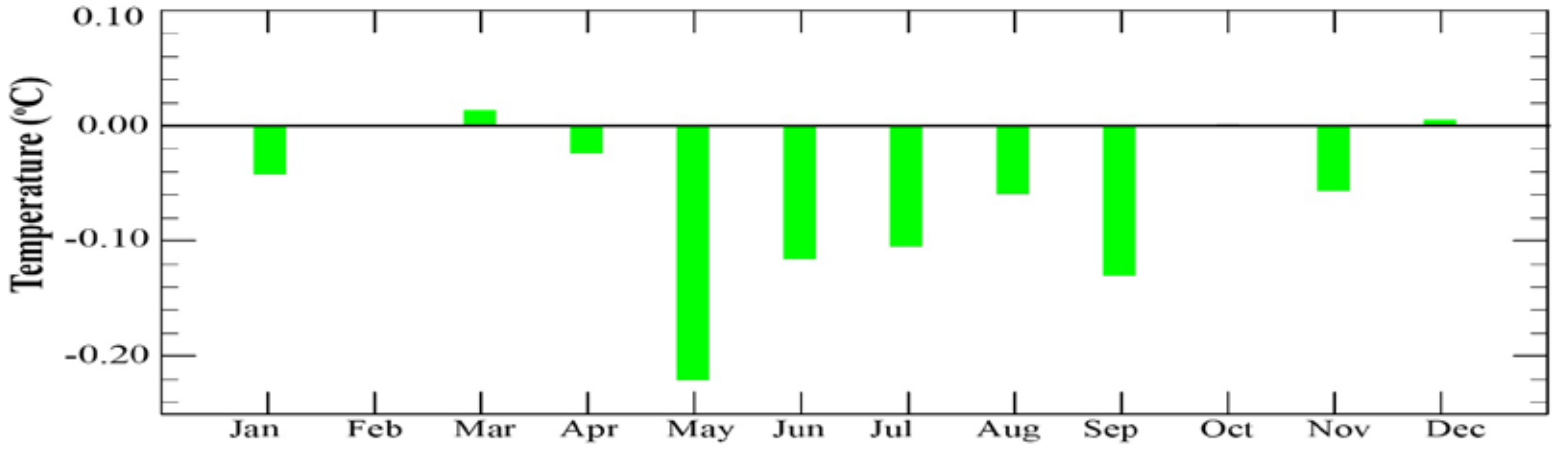


Seasonal climate change

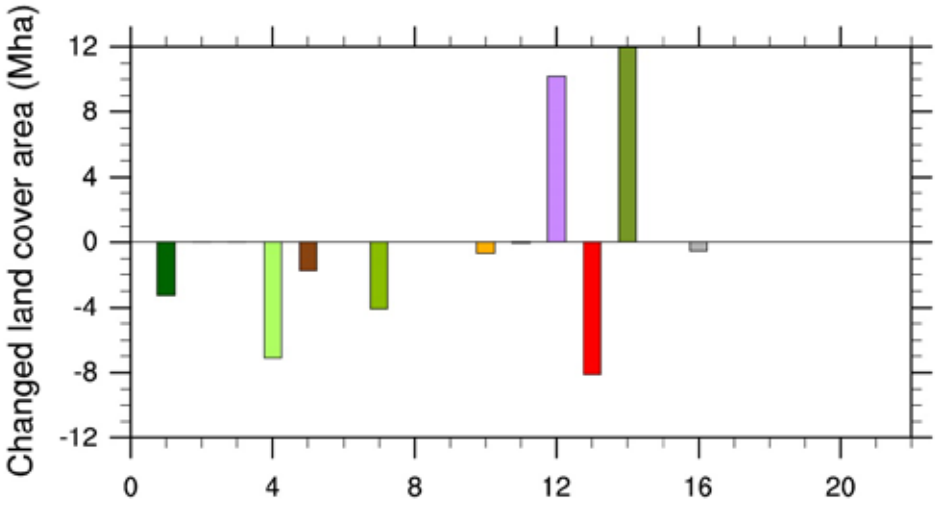
Land cover II – Land cover I

2m Temperature

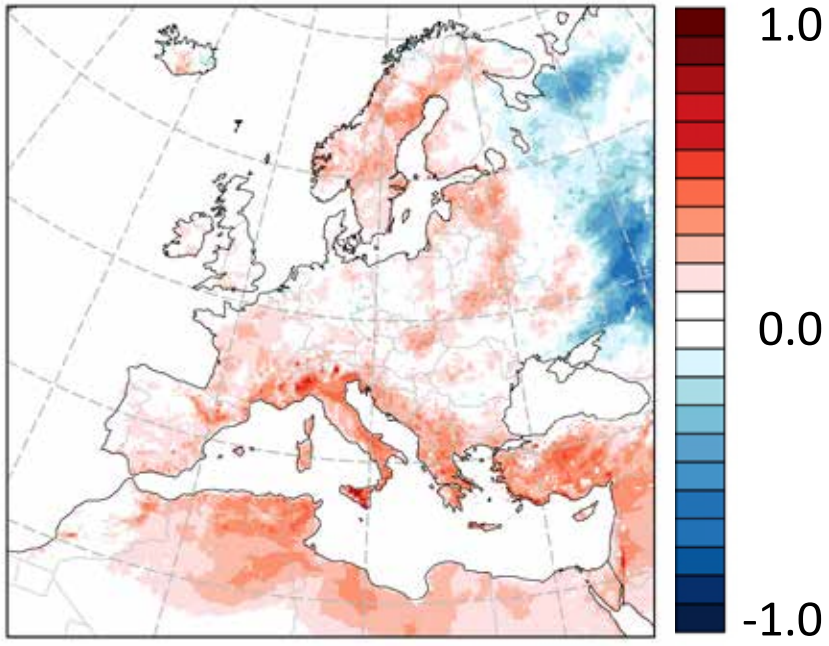


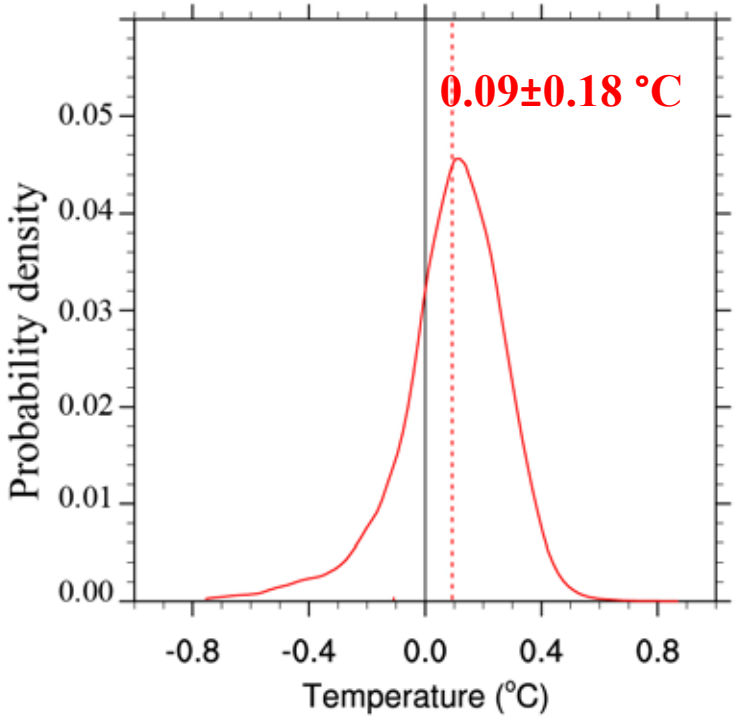


No Land Cover transition from Cropland



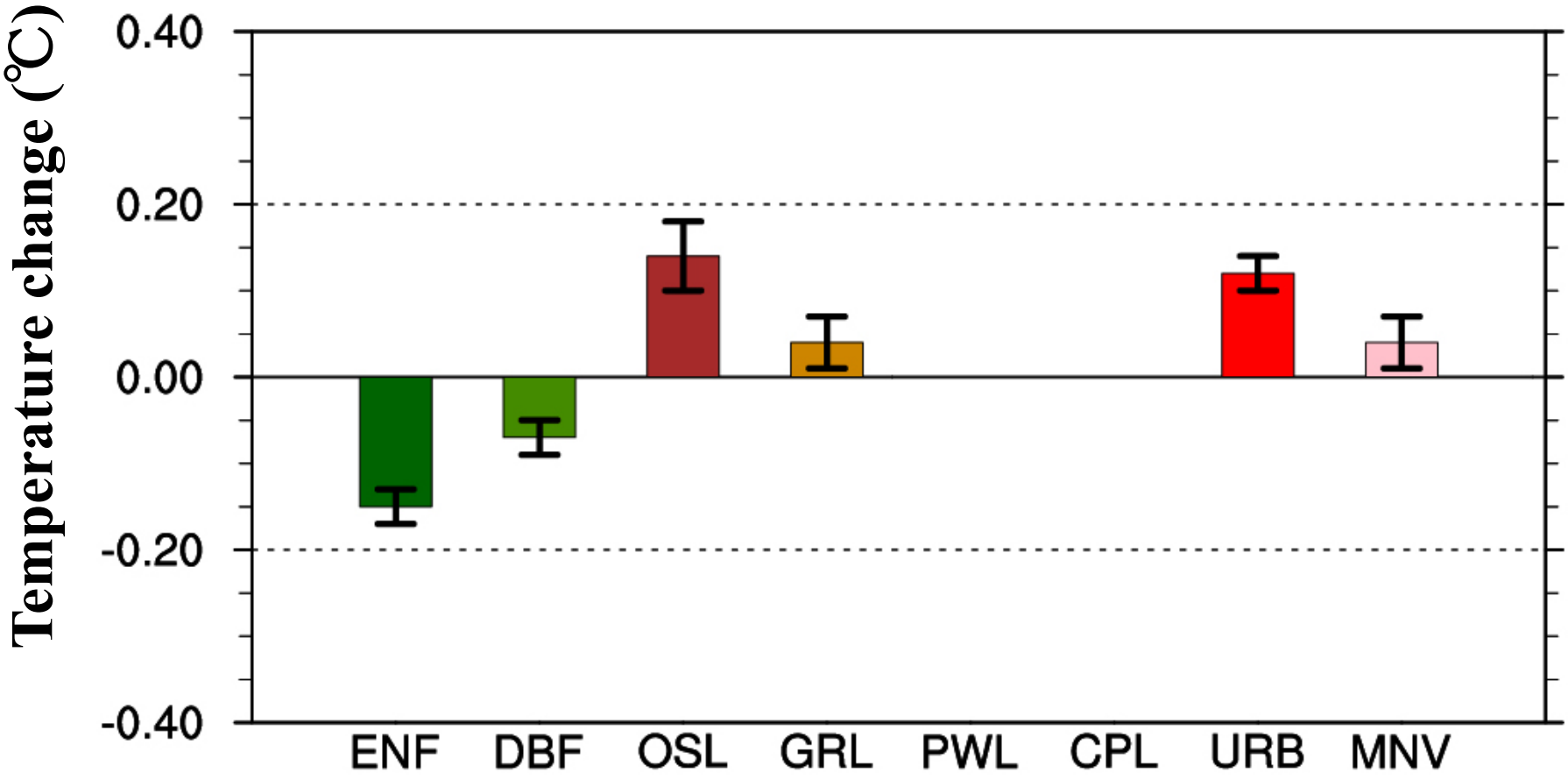
Temperature



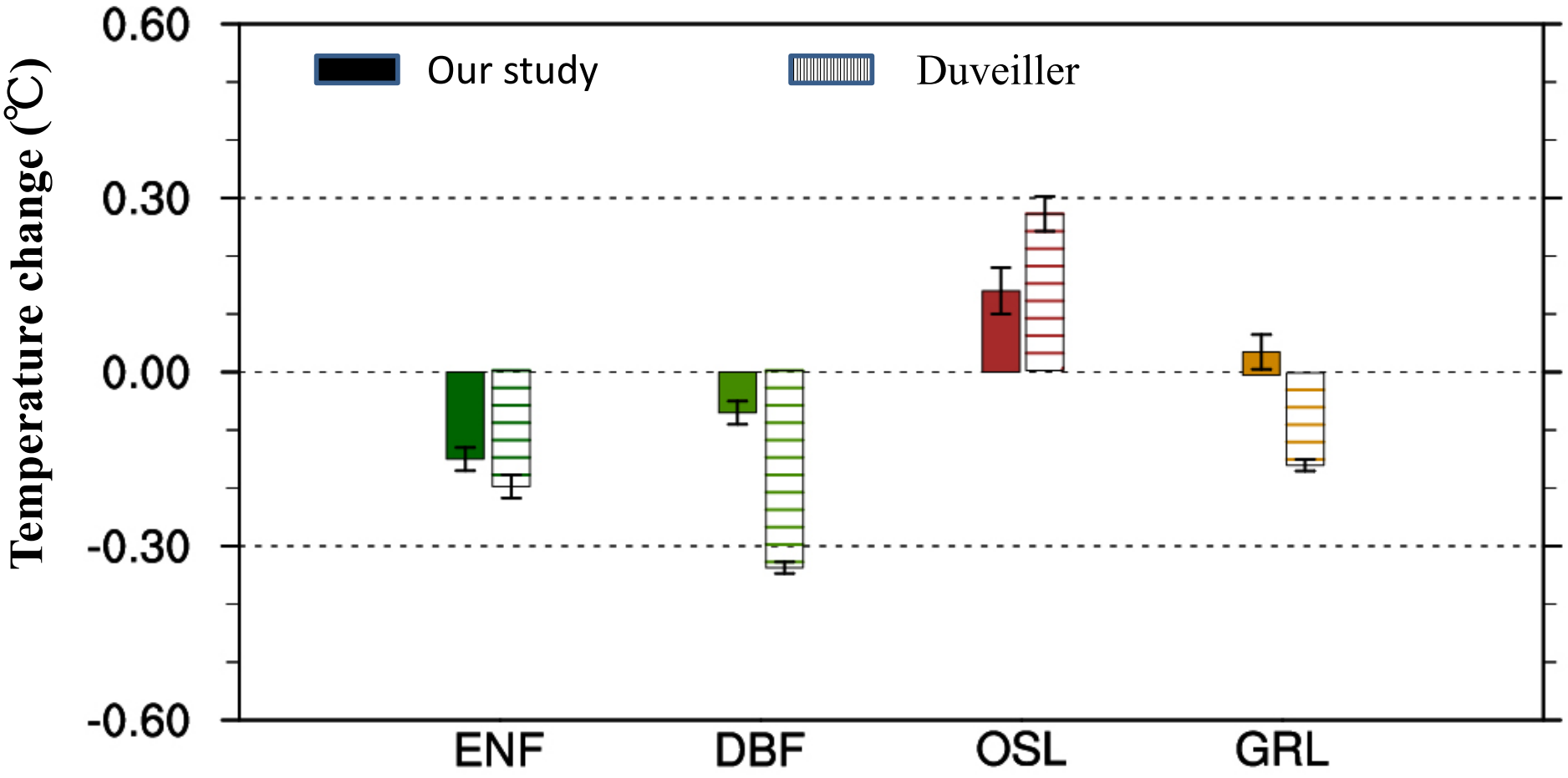


Decomposition of temperature change

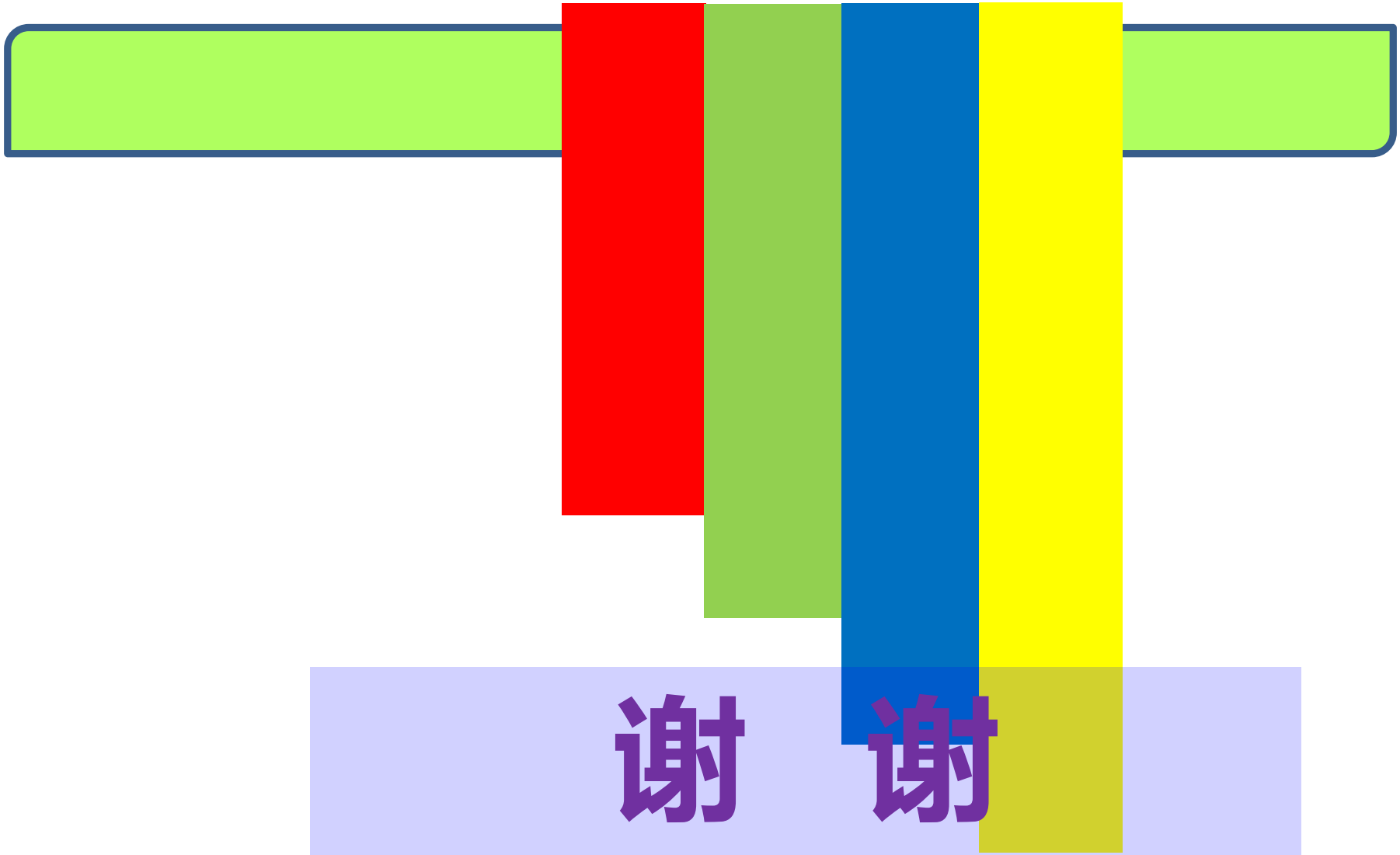
Temperature change caused by land cover transition from cropland



Comparison of the decomposed temperature



ENF: evergreen needleleaf forest **OSL: Open shrublands**
DBF: Deciduous Broadleaf forest **GRL: Grassland**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Thank You