climate extremes

ARC centre of excellence

Incorporating human modifications of the land surface into climate projections

Annette L. Hirsch

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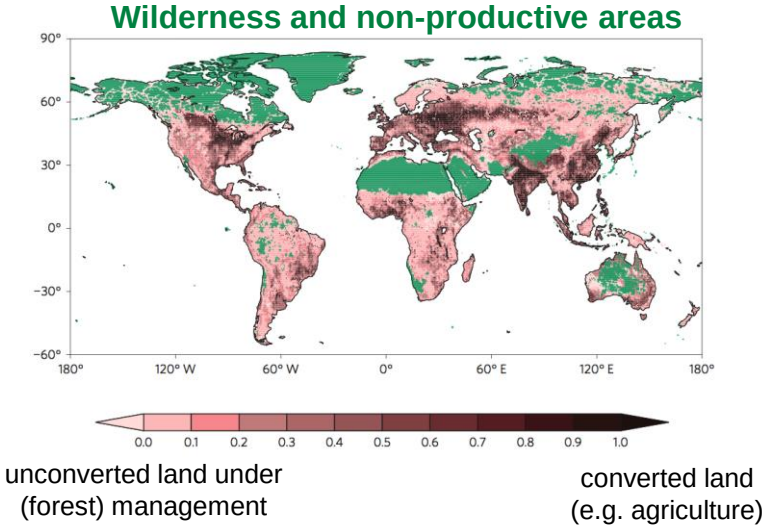
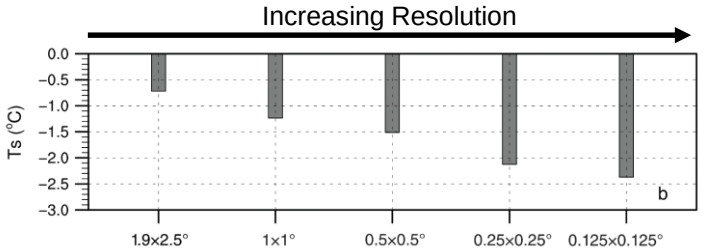
70% of the Earth's land areas have been modified by human activity with consequences on our climate system

Most existing coordinated climate projections do not include human management beyond vegetation changes and GHG emissions

As we increase the resolution of climate models, less information from the land surface is lost from averaging



Luyssaert et al. [2014] doi:10.1038/NCLIMATE2196

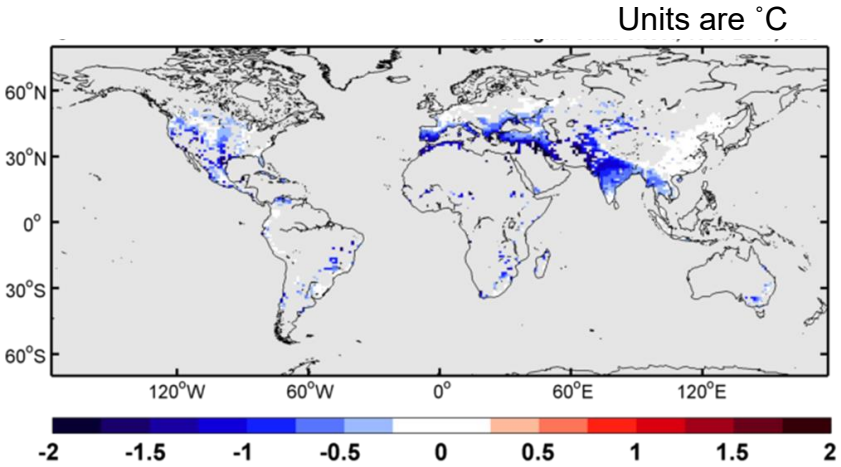


Chen and Dirmeyer [2018] doi:10.1002/joc.5973

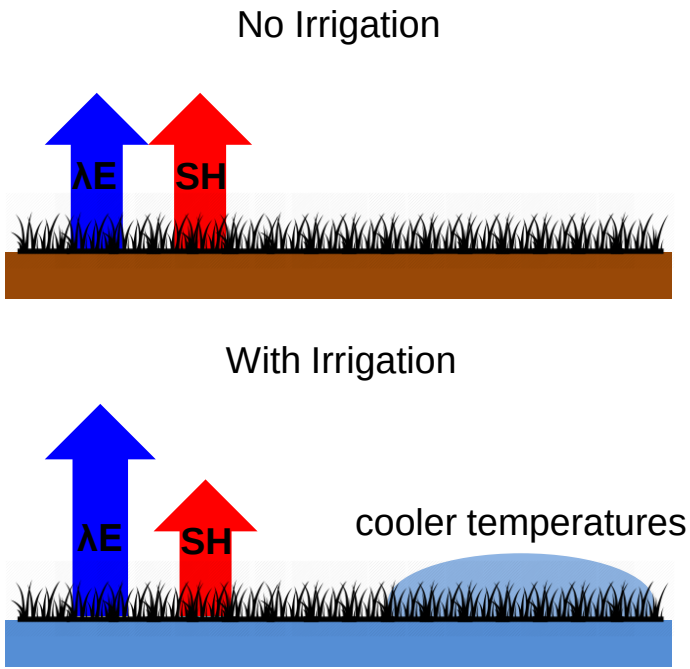
Changes across a landscape alter energy and water exchange between the land and the atmosphere

- Radiative changes via surface albedo
- Turbulent transfer via roughness
- Evapotranspiration and photosynthetic activity
- Runoff
- Boundary layer structure

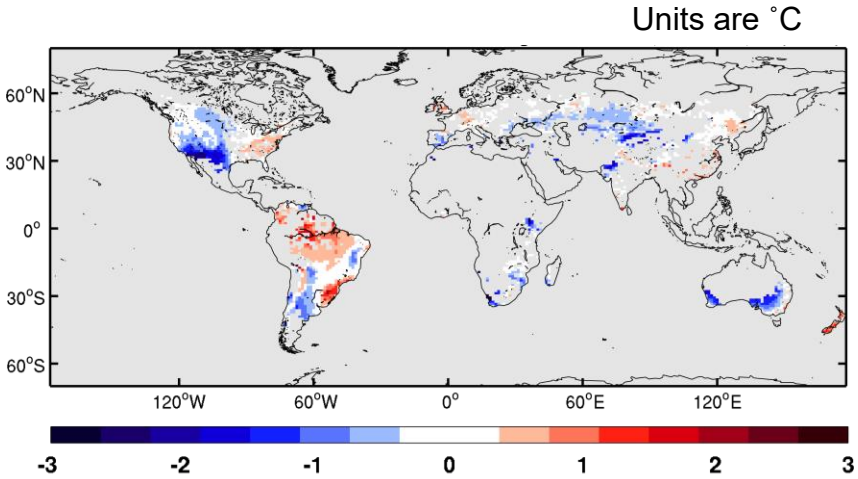
Irrigation induces surface cooling by increasing evaporation



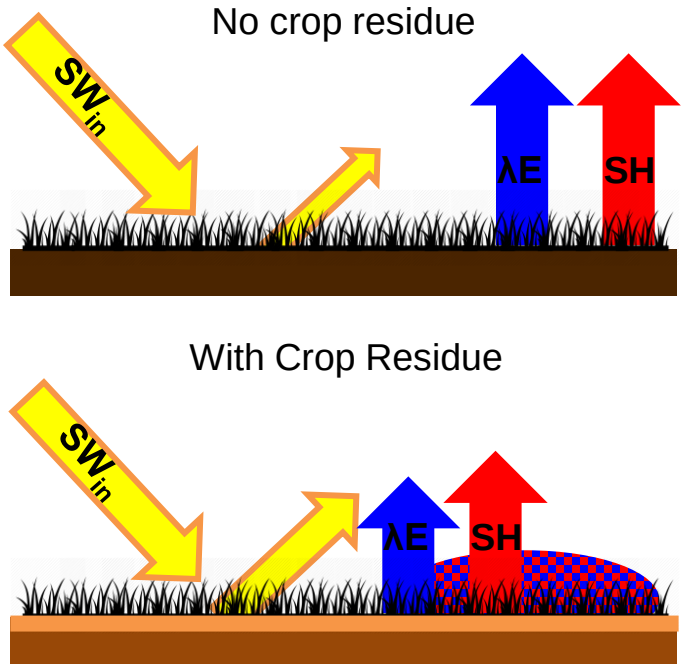
Thiery et al. [2017] doi:10.1002/2016JD025740



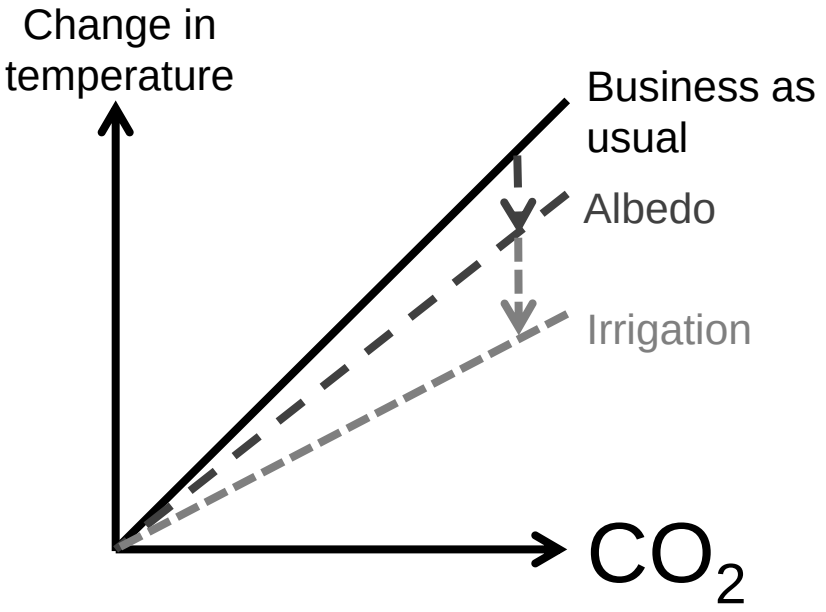
Change in extreme hot temperatures due to crop residue management

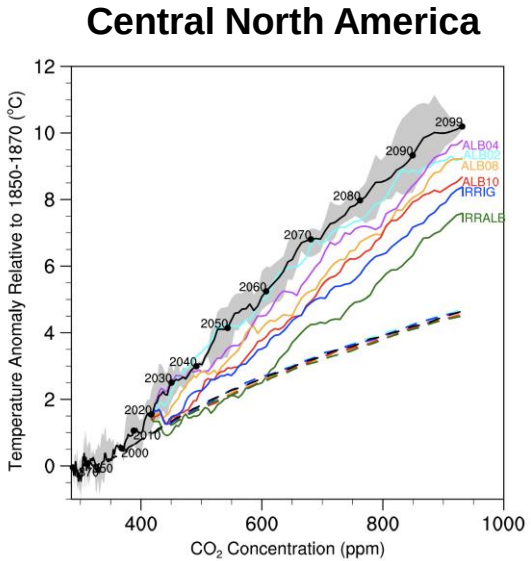


Hirsch et al. [2018] doi:10.1111/gcb.14362



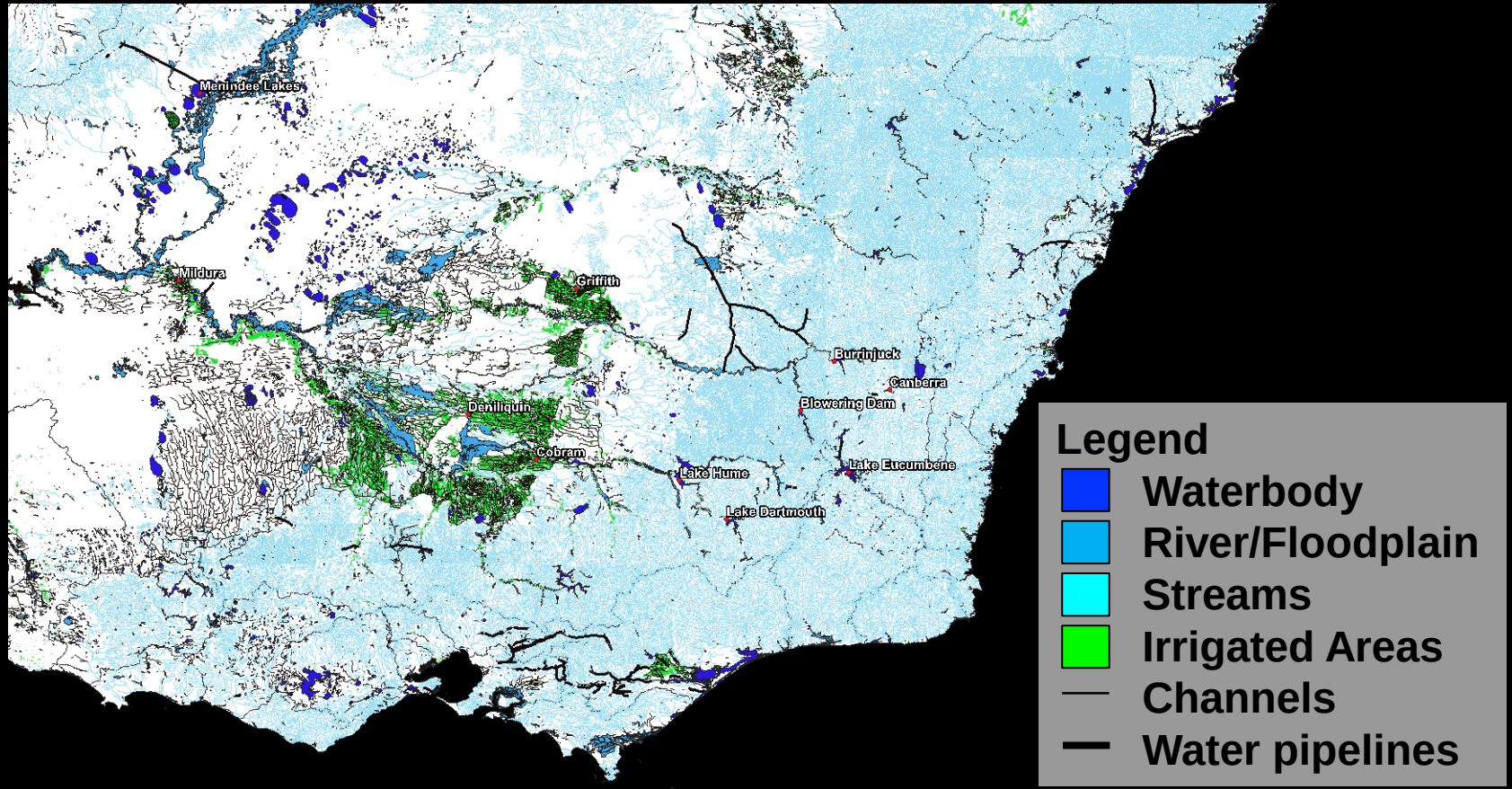
Climate model projections of extremes are sensitive to land management scenarios





Hirsch et al. [2017] doi:10.1002/2016JD026125

BoM GeoFabric provides us with detailed information on our hydrological network



2m Surface Cover

Building Zone

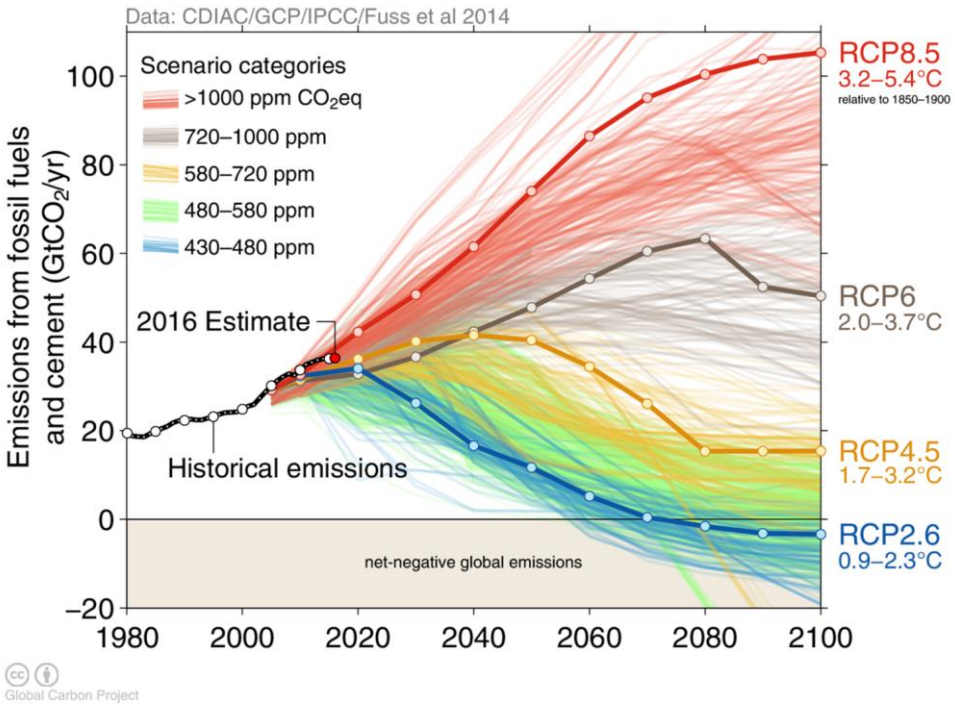
Building Area

Building Maximum Roof Height

Building Roof Material

- Metal
- Tile
- Plastic/Fibreglass
- Flat Concrete

New datasets are becoming “available” characterizing urban landscapes



High-resolution climate projections required detailed information of the land surface

New datasets make it possible to improve the representation of hydrological networks and urban geography

This can enhance our ability to evaluate future climate risk and build resilience

www.climateextremes.org.au