



*Facing climate change:  
a Mediterranean perspective*

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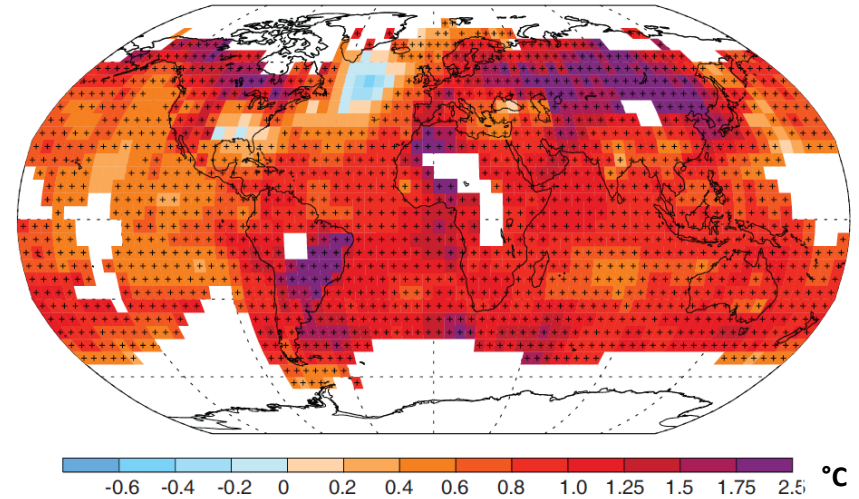
National Research Council of Italy

**Climate Change in the Mediterranean  
and the Middle East: Challenges and Solutions**  
Nicosia, Cyprus, May 18-19, 2018

# Two main conclusions from IPCC AR5

**Warming of the climate system is unequivocal**

Change of average temperature 1901-2012



**Human influence on the climate system is clear**

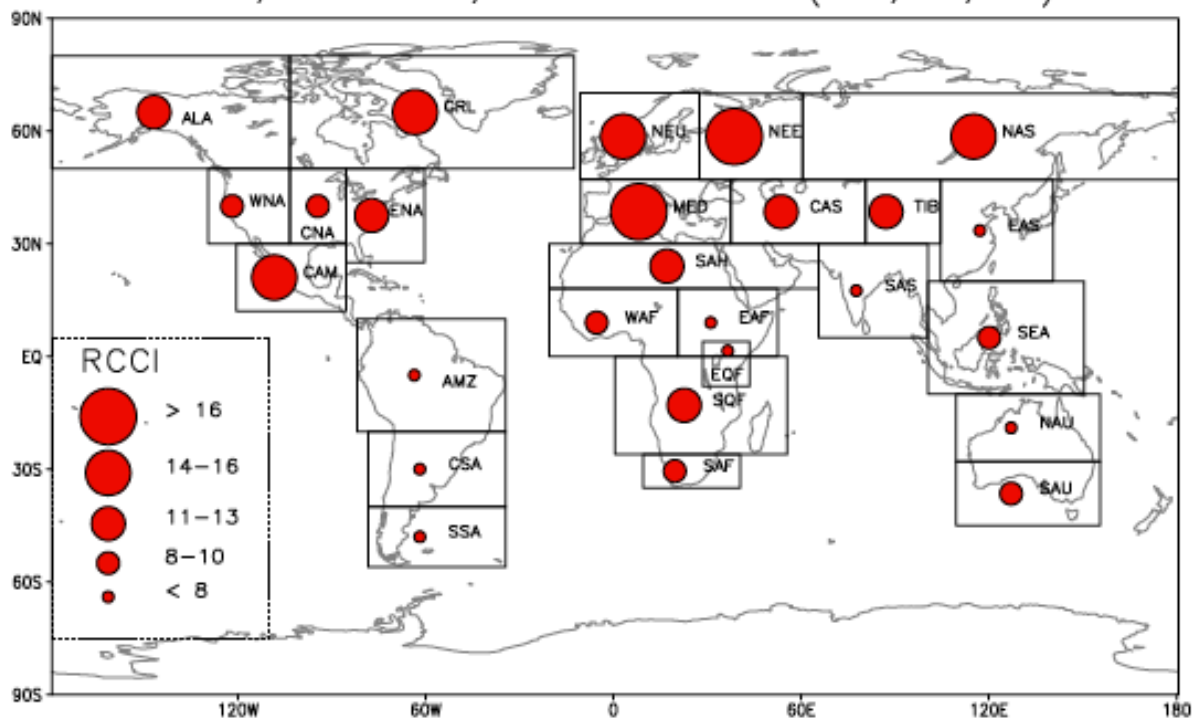


# *The Mediterranean: a climate hot spot*

## Regional Climate Change Index (RCCI)

The Mediterranean area represents one of the main climatic hotspots at the global level, taking into account the projections of both temperature and precipitation trends

Giorgi, 2006



# *CNR and the climate research in the Mediterranean*



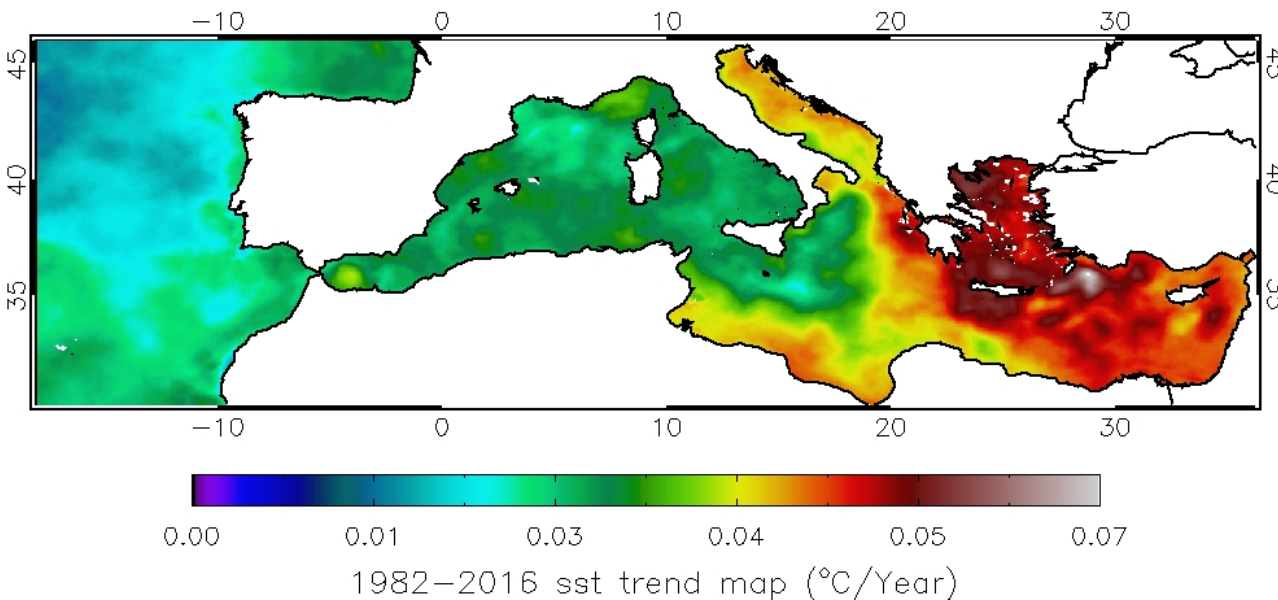
Italy lies in the middle of the Mediterranean and the national scientific community is naturally very active in climate research

CNR is the main research Institution in the Country and over 1000 of the CNR scientists are active in the field

Within the CNR Department “Earth system science and environmental technologies”, 12 Institutes perform research under four thematic areas, all important for climate:

- Global change and biogeochemical cycles: dynamics, impacts and mitigation
- Sustainable and efficient management of natural resources, ecosystems and biodiversity
- Natural and anthropogenic environmental risks
- Earth observations

# Climate change in the Mediterranean: the sea

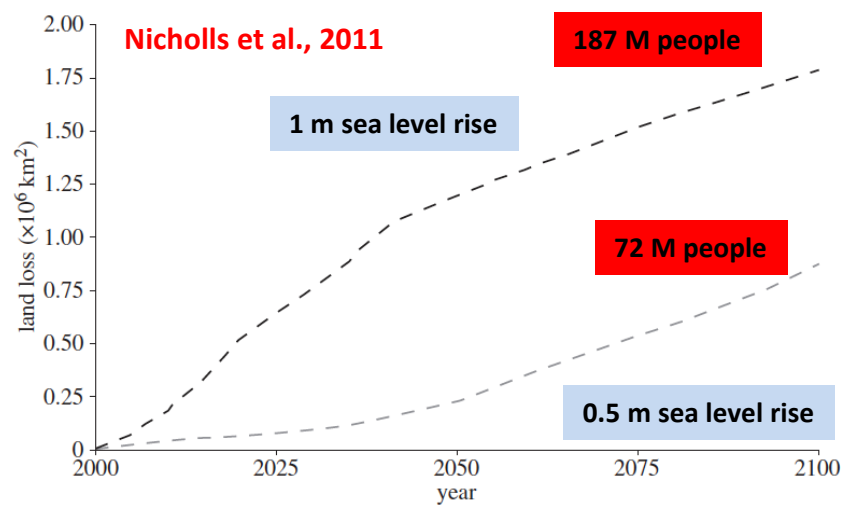
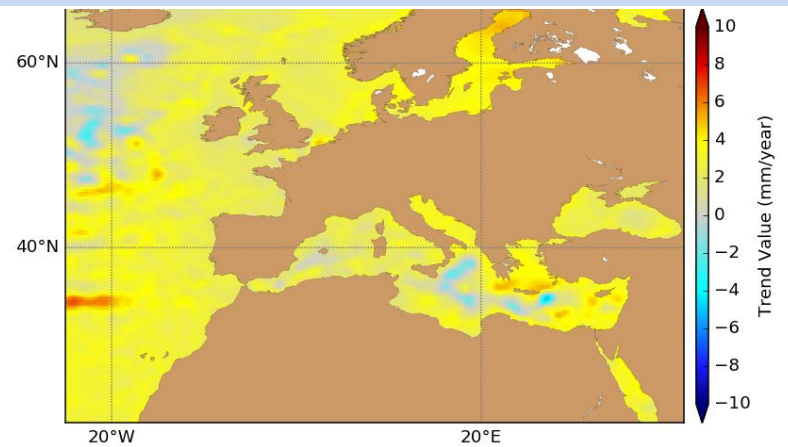


The Mediterranean SST is warming up 0.04 °C/year, much higher in the east, and also much higher than the Atlantic Ocean

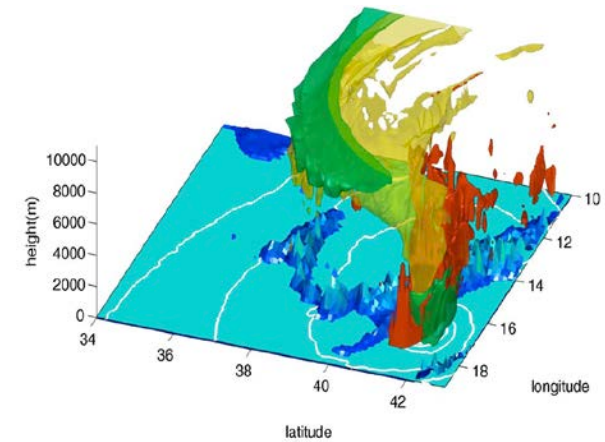
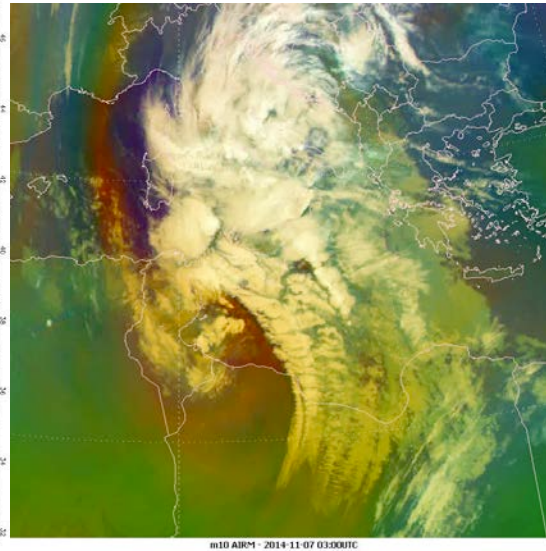
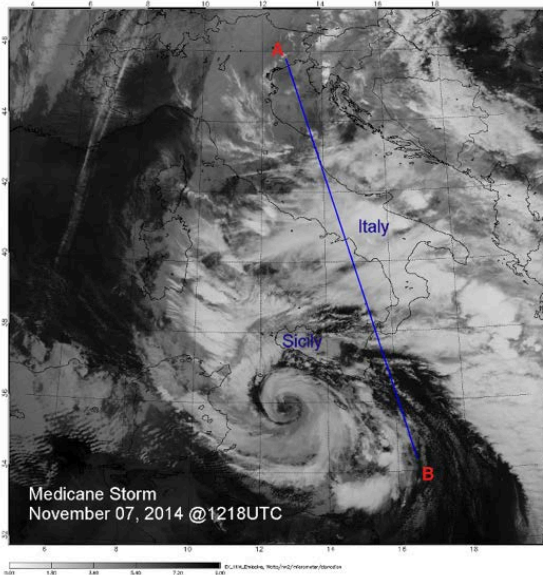


Sea level increase is a risk for coastal areas

Courtesy of R. Santoleri

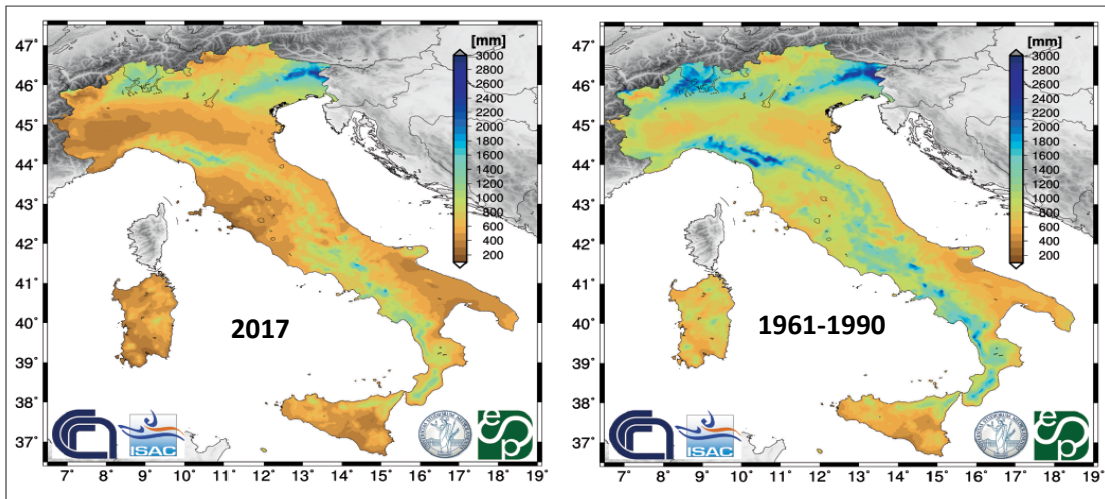


# Climate change in the Mediterranean: meteorology



Medicanes are intense and destructive mesoscale cyclones with similarities with tropical hurricanes and are known to struck occasionally the Mediterranean (ca. 1.5 events per year). The dynamics of Mediciane genesis and evolution is only partially known. Recent climate model runs have shown a tendency of Medicanes to decrease in number, but increase in severity, affecting areas islands (e.g., Balearic, Sicily, Sardinia, Crete, etc.) causing severe damages before being slowed down by the friction ashore and by mountains.

# Climate change in the Mediterranean: temperature and precipitation



Brunetti and Maugeri, 2018

For each degree temperature increase:

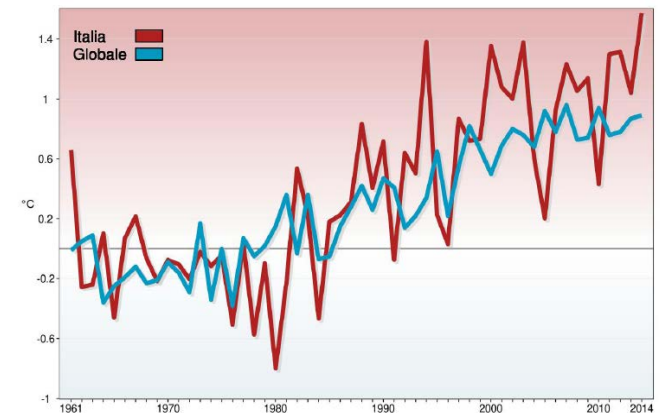
- ✓ 6% reduction wheat global production;
- ✓ 3% reduction rice global production;
- ✓ 7% reduction maize global production;
- ✓ 3% reduction soy global production.

Zhao et al., 2017

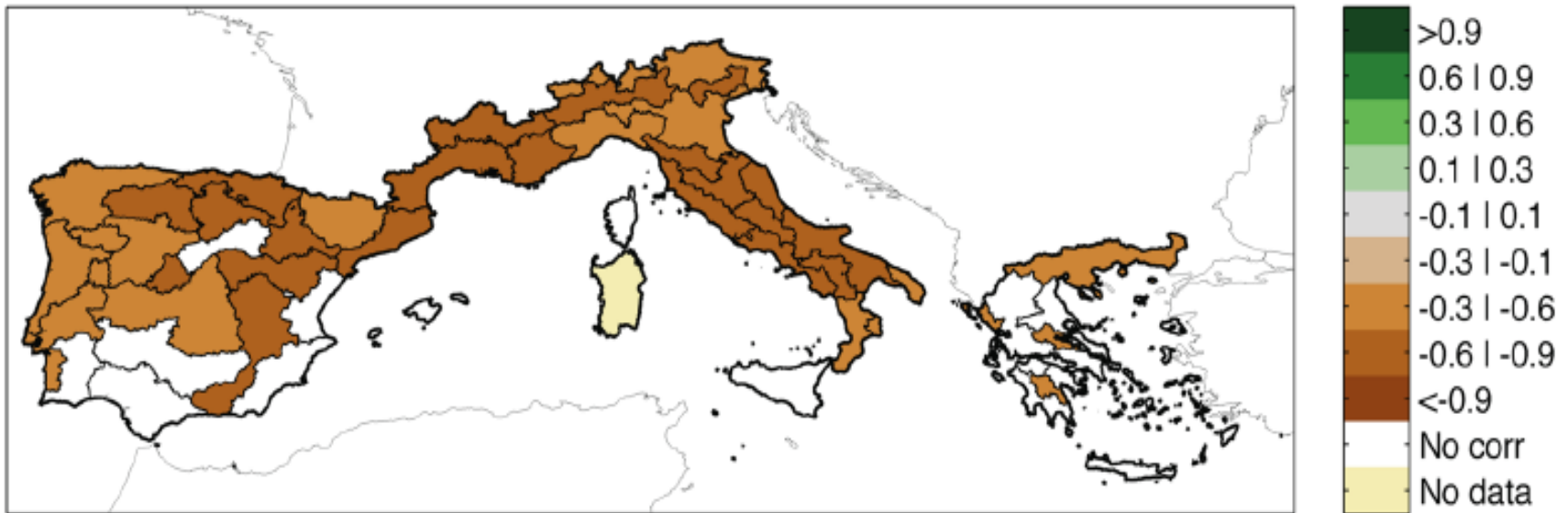
Decreasing precipitation



Increasing temperature



# *Climate change in the Mediterranean: droughts and fire*

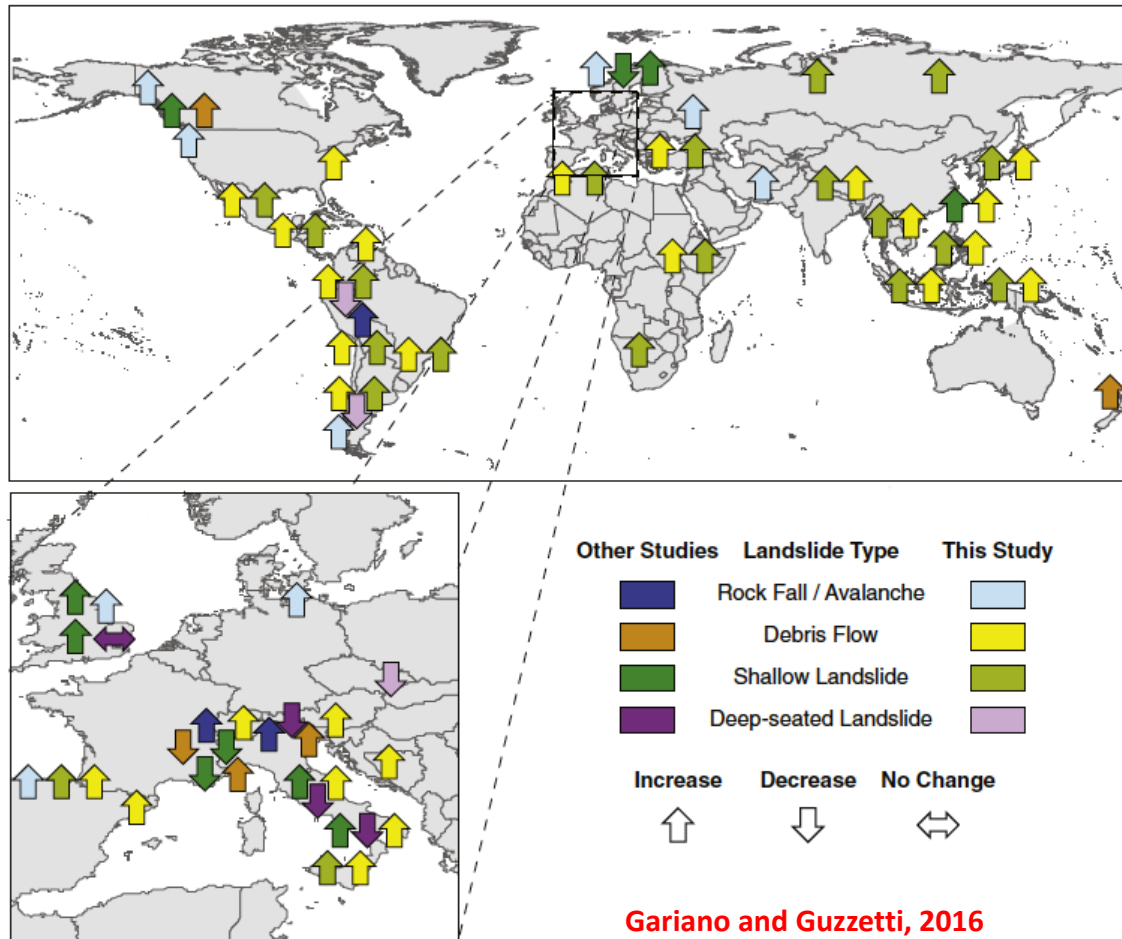


*Turco et al, 2017*

Strong correlation between drought conditions and area burned by summer fires (from observed data). The increase in droughts will potentially lead to a significant increase of burned area in the coming years



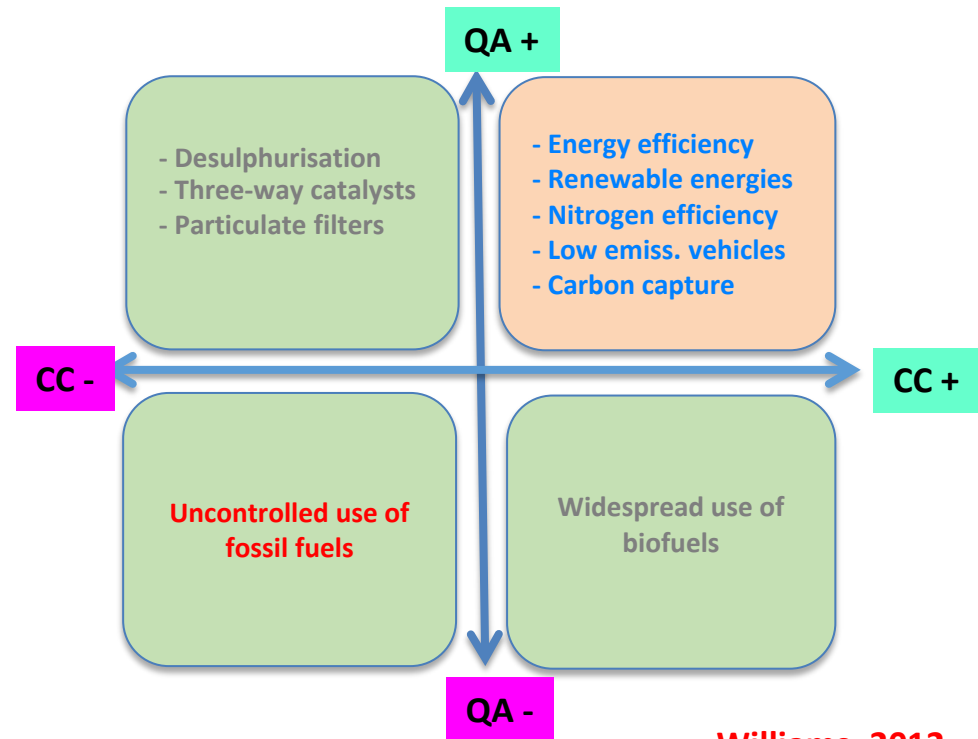
# Climate change in the Mediterranean: landslides



Gariano and Guzzetti, 2016

# Climate change in the Mediterranean: air quality

- All anthropogenic activities are responsible for the emission of gaseous and particulate pollutants that modify atmospheric composition
- Several species affect both air quality and climate
- Still, these two environmental challenges are viewed as separate issues, which are dealt with by different science communities and within different policy frameworks
- Many emission reduction policies simultaneously improve air quality and mitigate global warming (*win-win policy options*), while other options that may provide benefits to one aspect, worsen the situation in the other (*win-lose policy options*)

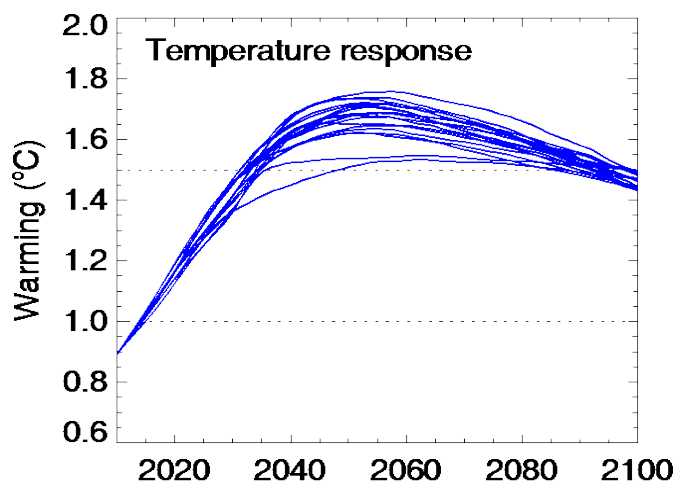
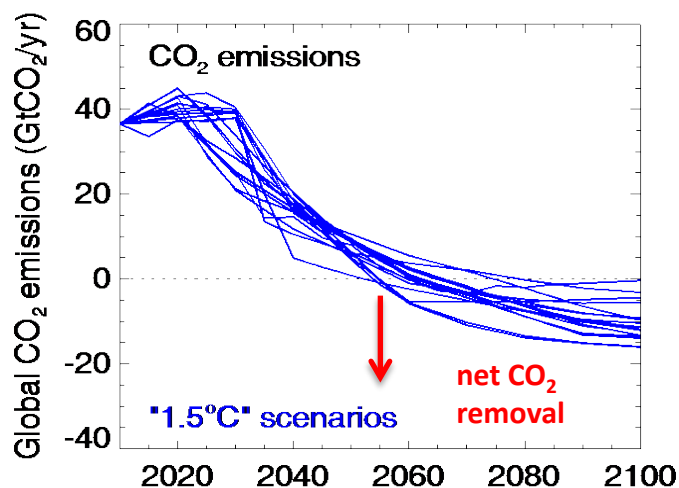


# Paris agreement

**Article 2:** Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C ...



12 December, 2015



M. Allen, 2018



# *Five priorities for weather and climate research\**

- **Deliver science for services:** information must be tailored to reach the right person in the right form at the right time
- **Build seamless models:** Earth system models that merge with data and work across domains, from weather to climate, from hydrology to air quality
- **Improve infrastructures:** advanced computing infrastructures, observing networks and technology improvement in monitoring techniques
- **Nurture a diverse workforce:** education and training of early-career scientists, service-focused and with a global outlook
- **Share ideas:** share experiences deriving from different expertise, including social sciences

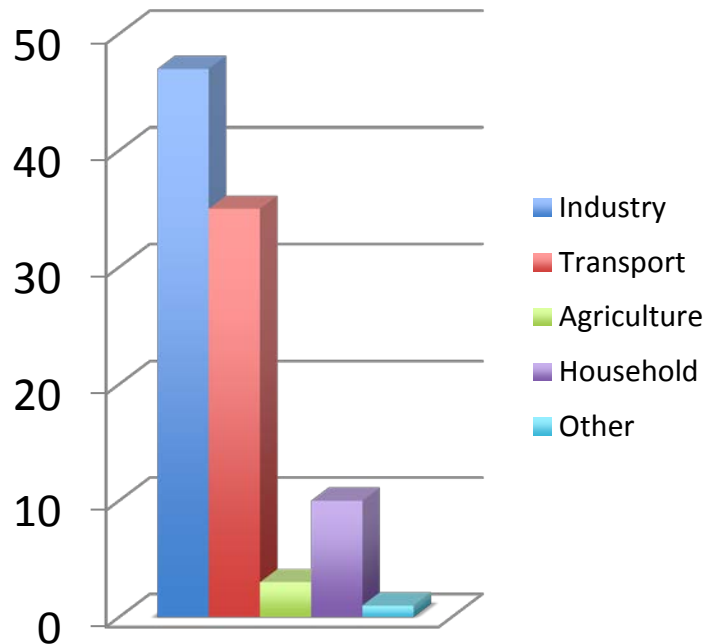
*\*(Hov et al., 2017)*



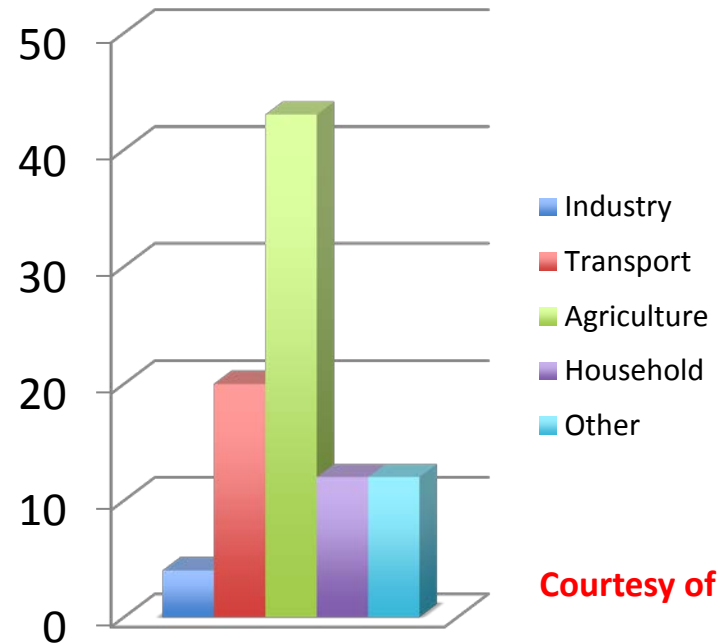
# Education is a key

Social acceptability is key to any environmental policy option and a correct information for citizens is therefore required

**Perception of PM sources**



**Actual PM sources (IIASA, 2014)**



Courtesy of S. Fuzzi

Cohort of 2300 people from 4 Italian cities (SEFIRA project)





***Thank you!***

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