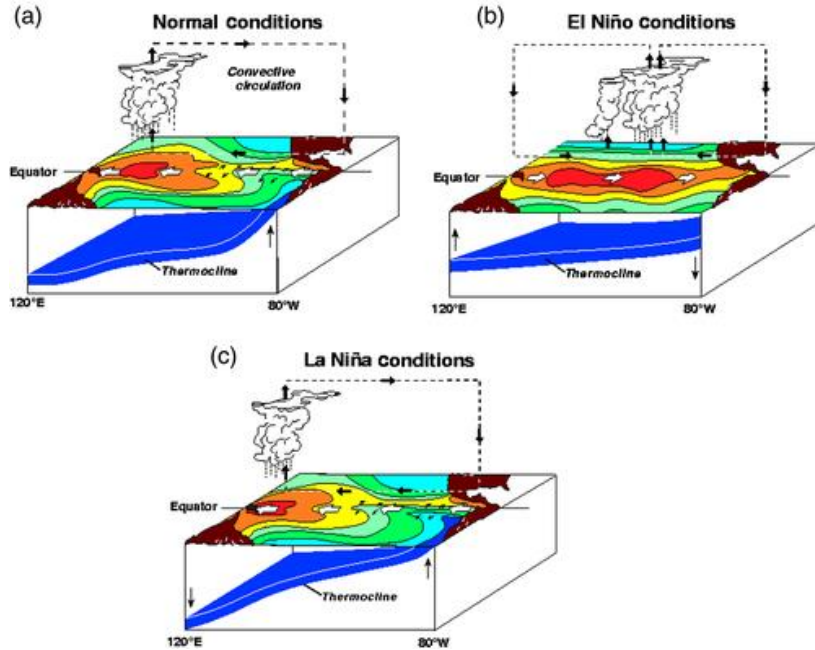


The Global Hazard of Extreme El Niño's

Research spanning across the WCSSP Projects

Professor Adam Scaife, Met Office



A *natural* oscillation in our climate system

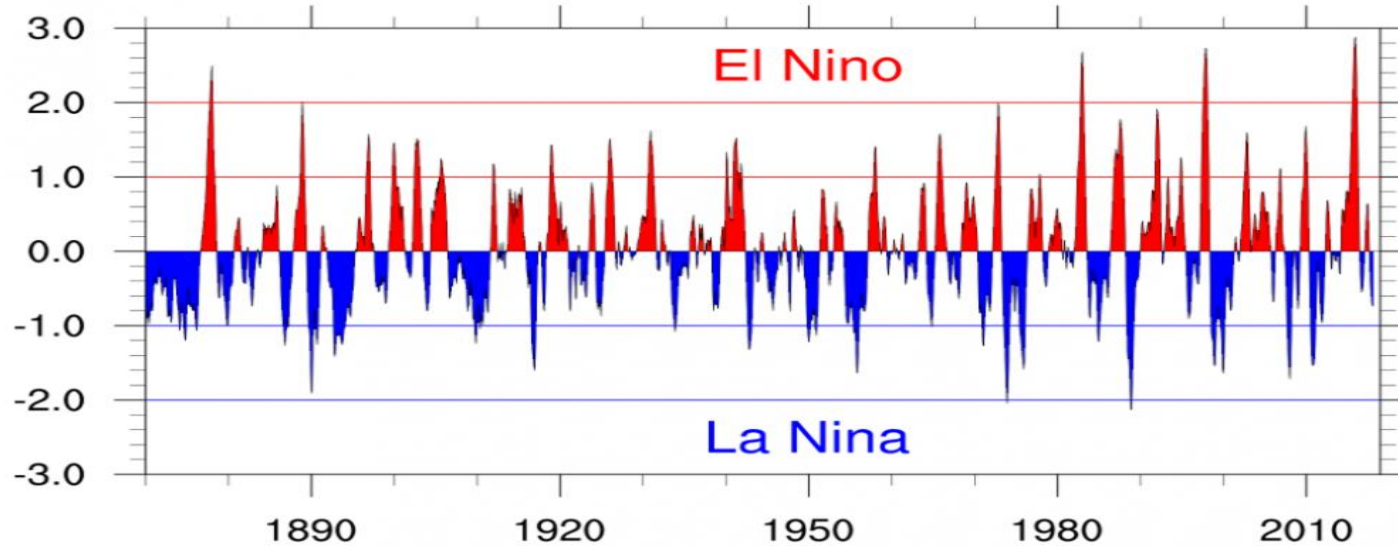
The largest natural change in climate from one year to the next

Some facts and figures:

- Largest events reach $\sim 3^{\circ}\text{C}$
- Peaks in winter – hence the name
- Inject as much heat into the atmosphere as all power stations combined
- Has been going on for thousands of years

Fig. courtesy of NOAA

History of El Niño Events

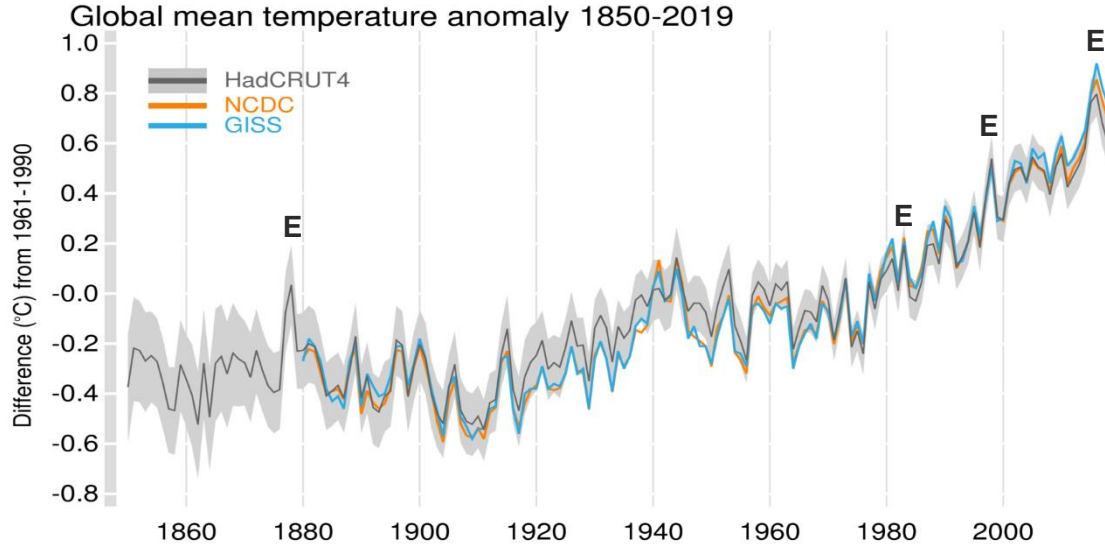


El Ninos occur every few years

El Ninos are stronger than La Ninas



El Niño events affect *global* temperature

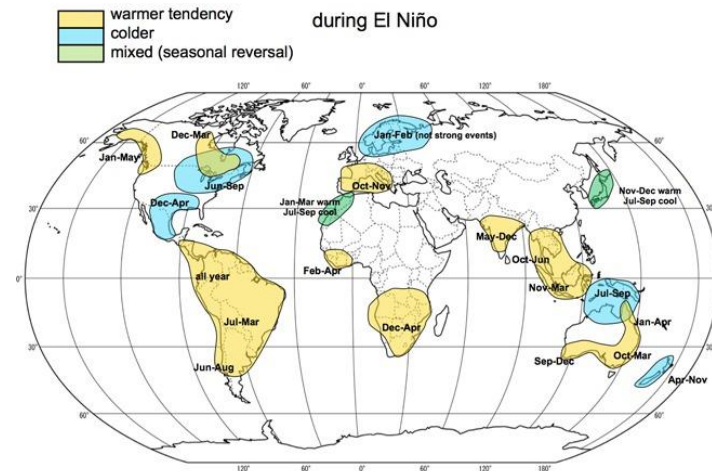
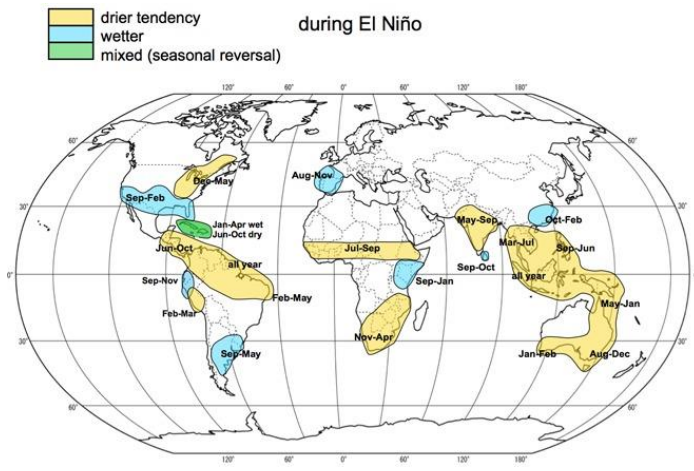


Each 1 degree of El Niño => around 0.1 degree globally

Determines the record year; currently 2016

More extreme local impacts...

Meteorological impacts extend worldwide

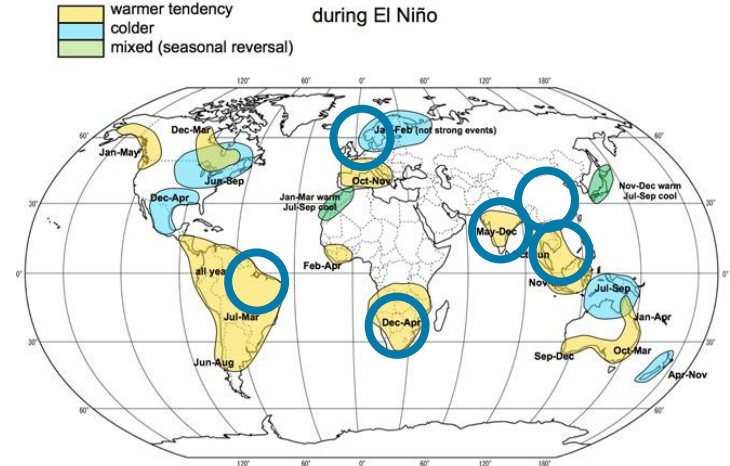
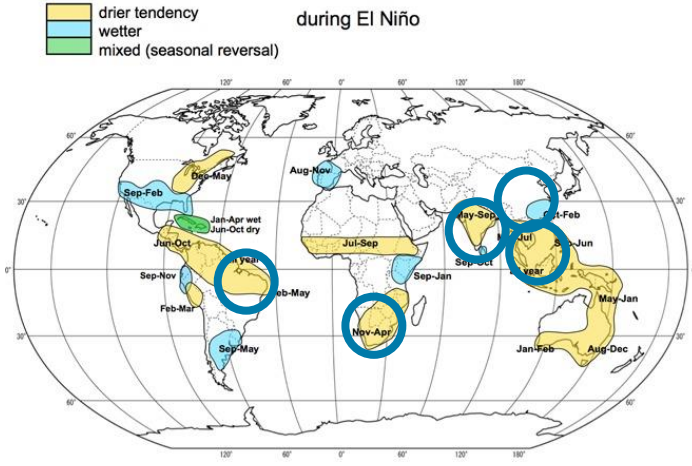


Rainfall and hence drought/flood impacts

Temperature and hence heatwave/cold snaps



Meteorological impacts in all CSSP countries



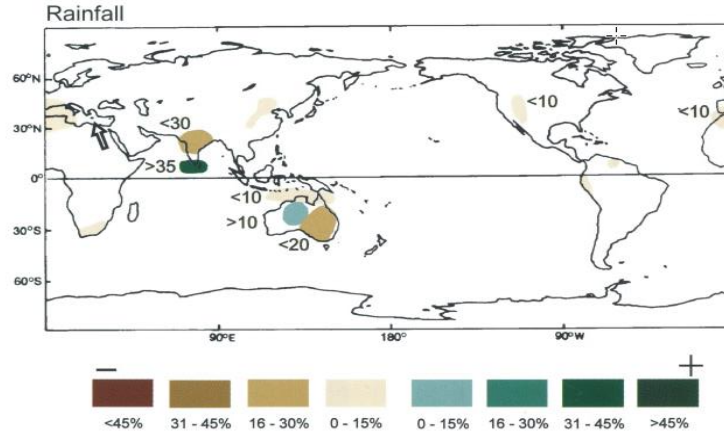
Rainfall and hence drought/flood impacts

Temperature and hence heatwave/cold snaps



Q1: How good are our observations of El Niño?

1877



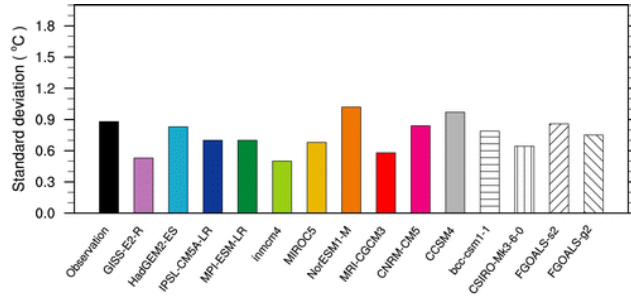
One of the biggest events on record occurred in 1877

Current observations are sparse but there are untapped records such as ship log books and other meteorological archives

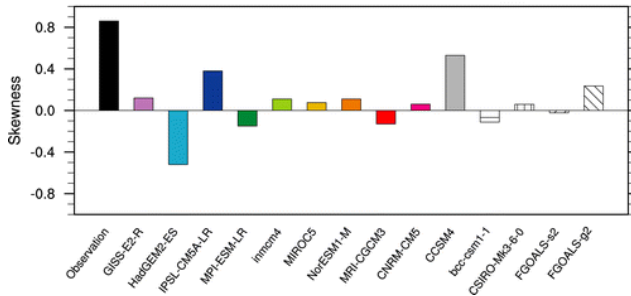
Data rescue and digitisation could reveal much about the regional impacts

Q2: Do Climate Models simulate El Niño?

Activity



Asymmetry



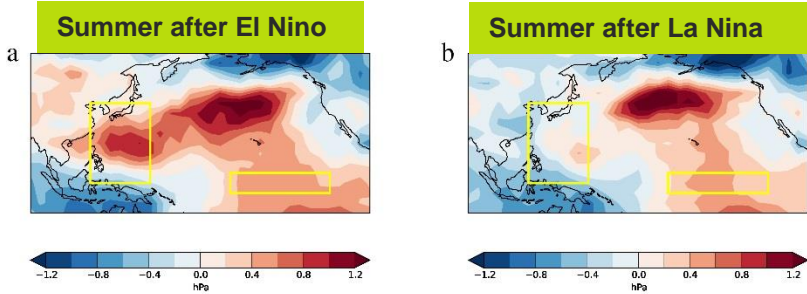
Models do well in simulating the observed strength of El Niño - La Niña cycles

BUT

They can not simulate the difference between El Niño and La Niña and hence can not simulate the largest El Niño events



Q3: What are the real regional impacts of El Niño?



Hardiman et al., 2018

Met Office Hadley Centre

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2019 Yangtze River Seasonal Forecasts

05 May 2019
© Crown Copyright 2019 Met Office

This document provides forecasts for the Yangtze river region in 2019, based on the Met Office's seasonal forecast system. Forecasts are for area-averaged seasonal mean precipitation rate.

The map on the right shows the **basin average** region we are forecasting for. The location of the Three Gorges Dam is marked with a star.

The current headline results for this region are:

For JJA:

- There is a 46% chance of above-average rainfall for the *basin average*.
- There is a 55% chance of below-average rainfall for the *basin average*.

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2019 Tropical Cyclone Landfall Seasonal Forecast for East Asia

1 May 2019
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This document provides a seasonal forecast of tropical cyclone landfall risk for East Asia during June-August 2019, based on the Met Office Global Seasonal Forecast system.

The map on the right shows the East Asia landfall region we are forecasting for. The location of Shanghai is marked with a star.

The current headline results are:

For June-August 2019:

- There is a 50% chance of above-average tropical cyclone landfalls in East Asia.
- There is a 50% chance of below-average tropical cyclone landfalls in East Asia.

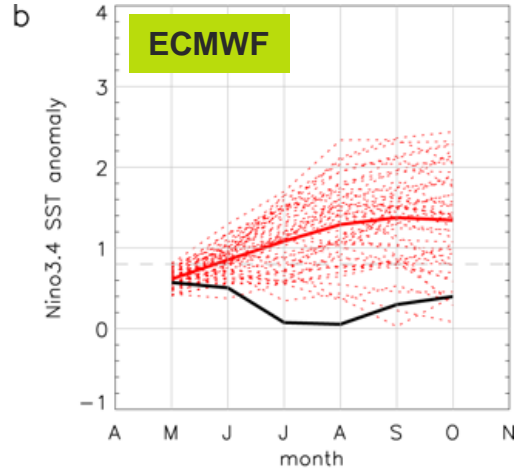
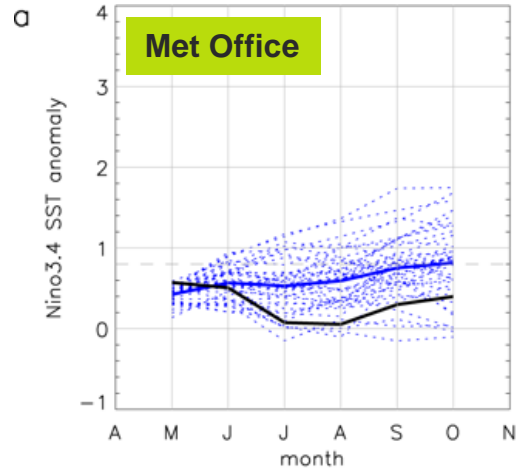
We only have a few extreme El Niños on record

In some regions they do not appear to have the opposite effect of La Niña

Is this real or just a fluke? How and why does this happen?



Q4: Can we accurately predict impending El Niño?



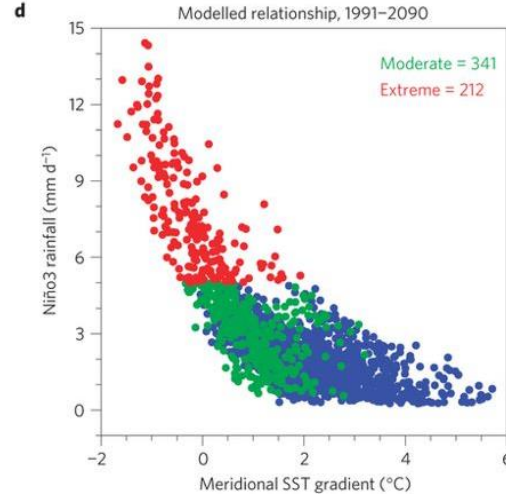
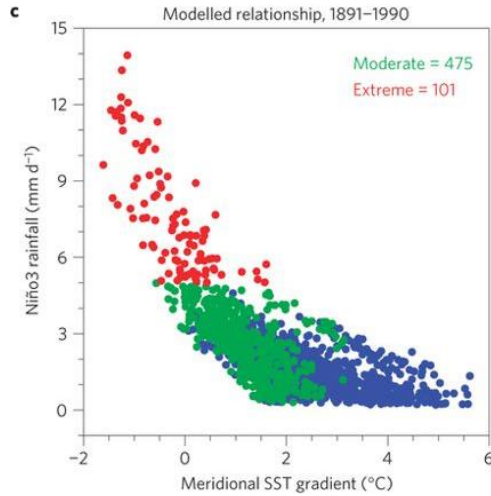
Ineson et al 2018

False alarms still occur in our climate predictions

Some climate prediction systems gave a false alarm in 2014 for example

Predicting the amplitude at lead times of a few months is still a challenge

Q5: Will climate change affect El Niño?



Cai et al., 2014

Some studies suggest a dramatic increase in the effects of El Niño on rainfall

We still do not know how the oscillation itself will change

Questions and activities

Have we got the best possible record of extreme El Niño events?

Do we know the real effects on CSSP countries of the next event?

How do we improve our modelling and prediction capability?

Are we ready for the next extreme El Niño?

What will happen to future El Niños under climate change?

