The contribution of reanalysis to climate monitoring.

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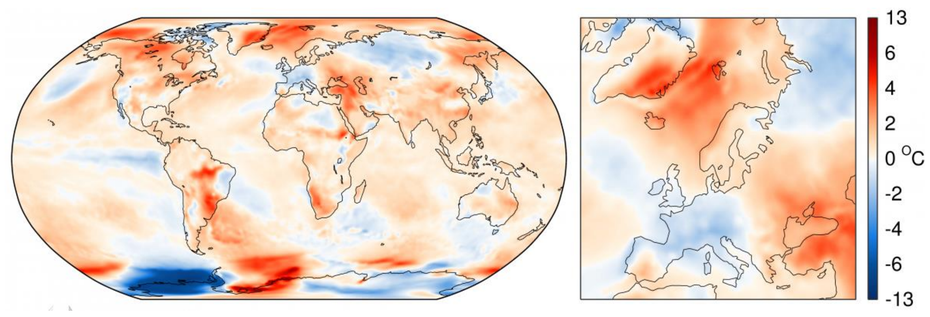
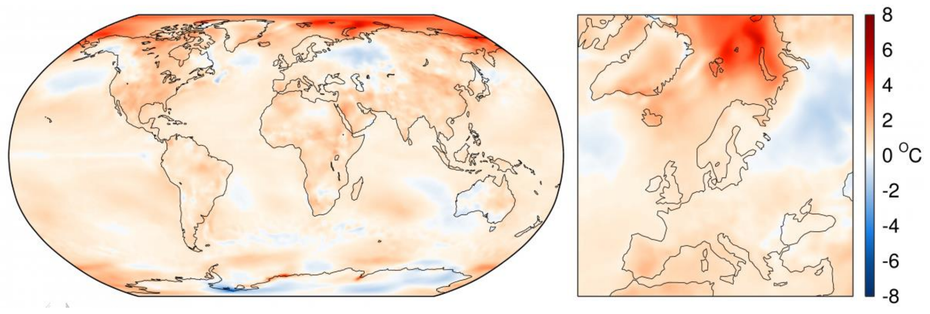
Abstract

The Copernicus Climate Change Service (C3S) includes in its product portfolio, reanalyses and a climate monitoring facility. These two products are being used to monitor the climate by providing monthly updates on the climate for several ECVs. The monthly updates are posted onto the Copernicus website (https://climate.Copernicus.eu/monthly-maps-and-charts) within a few days of the end of each month. Currently, the main source of content is the ERA-Interim global reanalysis. The content varies depending on the ECV, but typically includes global and European maps of anomalies for the month and the last year and global and European time series for monthly means and 12 month running means. The post for each month includes a short discussion about the salient points relevant to that month and ECV. The list of ECVs considered, to date, is surface air temperature, sea-ice, precipitation, surface humidity and soil moisture. Here, we show climate monitoring examples for September 2017.

Surface air temperature



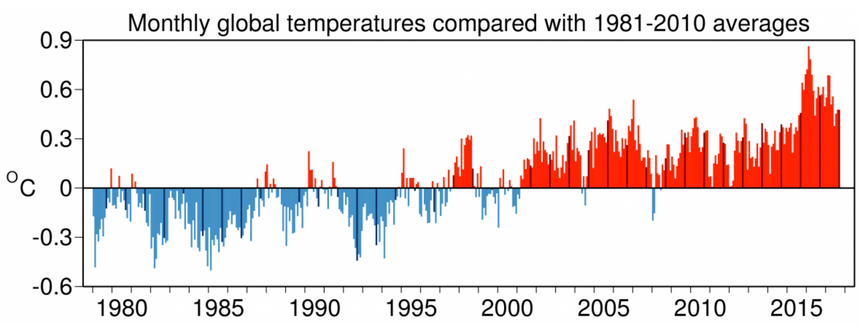
Surface air temperature anomaly for September 2017 relative to the September average for the period 1981-2010.



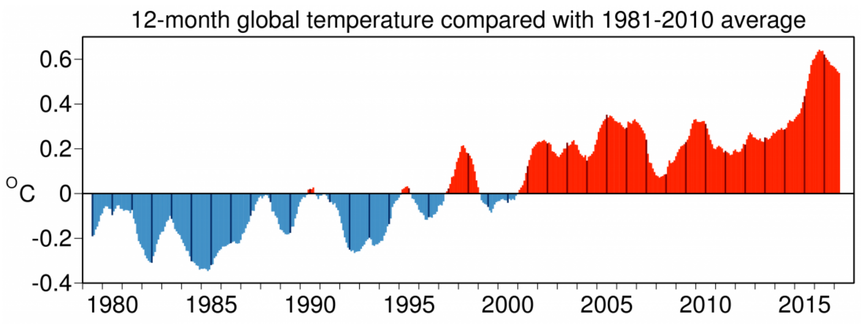
Surface air temperature anomaly for October 2016 to September 2017 relative to the average for 1981-2010.

Globally, the warmest instances of each month of the year occurred from October 2015 to September 2016. Each of the twelve months from October 2016 to September 2017 has been the second warmest on record for that month of the year. The twelve-month average from October 2016 to September 2017 was 0. 54°C above the 1981-2010 average. This is the second warmest, non-overlapping, twelve-month period on record and follows the warmest twelve-month period on record from October 2015 to September 2016, which had a temperature 0.64°C above average. 2016 is by far the warmest calendar year on record: its global temperature of 0.62°C above the average for 1981-2010 compares with the value of 0.44°C for 2015, the next warmest calendar year.

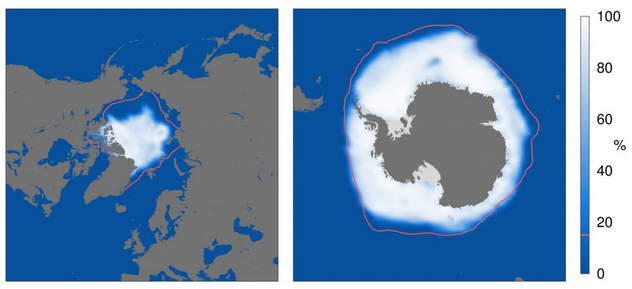
Monthly global-mean, surface air temperature anomalies relative to 1981-2010, from January 1979 to September 2017. The darker coloured bars denote the September values.



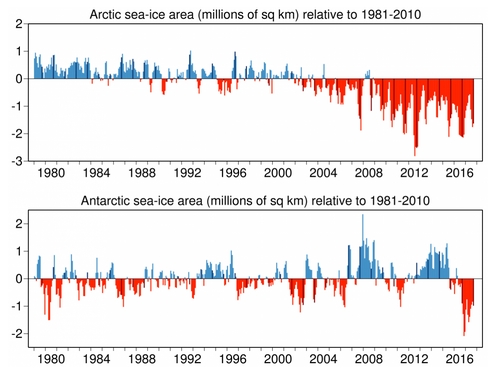
Running twelve-month averages of global-mean, surface air temperature anomalies relative to 1981-2010, based on monthly values from January 1979 to September 2017. The darker coloured bars are the averages for each of the calendar years from 1979 to 2016.



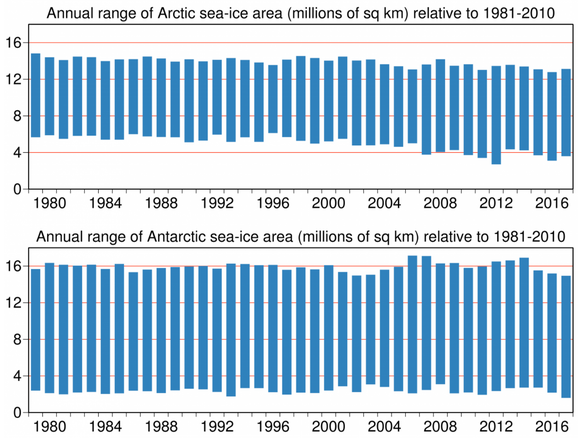
Sea-ice



Sea-ice cover for September 2017. The pink line denotes the climatological ice edge for September for the period 1981-2010.



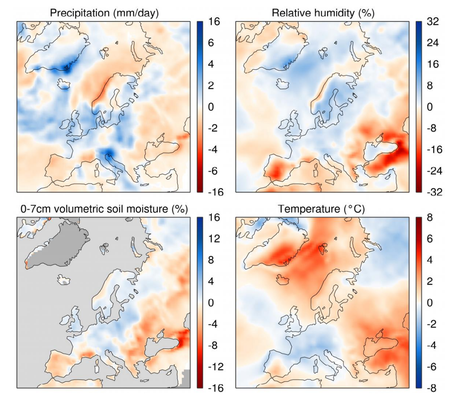
Area of the Arctic (upper) and Antarctic (lower) covered by sea-ice, shown as monthly anomalies relative to 1981-2010. The darker coloured bars denote the September values.



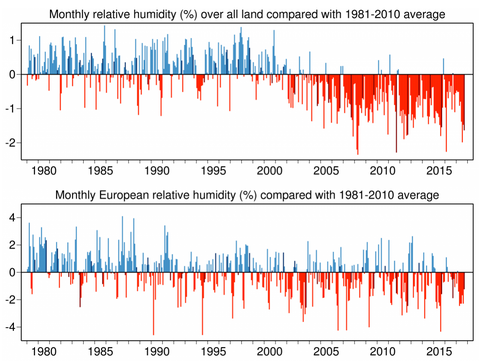
Annual range of sea-ice area from summer minimum to winter maximum for the Arctic (upper) and Antarctic (lower) based on monthly average values from 1979 to 2016. Maxima and minima for 2017 are based on all months of the year to date.

Arctic sea-ice cover exhibits a downward trend. Variability predominates for the Antarctic. Antarctic sea-ice cover has been substantially below average in the past year or so. Anomalies in Antarctic sea-ice cover in November and December 2016 were the most negative on record. Antarctic sea-ice cover was lower in September 2017 than in any September in the record and could become the lowest maximum on record.

Hydrological parameters

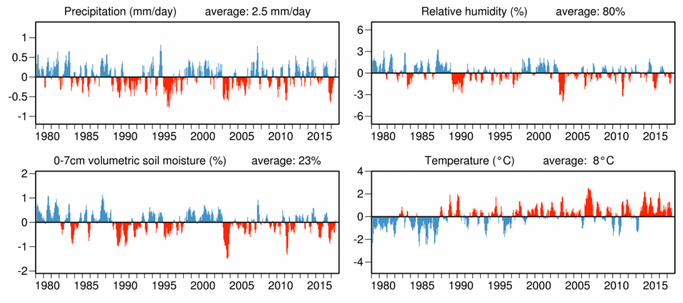


Anomalies in precipitation, the relative humidity of surface air, the volumetric moisture content of the top 7 cm of soil and surface air temperature for September 2017 with respect to September averages for the period 1981-2010. The darker grey shading denotes where soil moisture is not shown due to ice cover or climatologically low precipitation.



Monthly anomalies with respect to 1981-2010 in the relative humidity of surface air averaged over all and European land areas, from January 1979 to September 2017. The darker coloured bars denote the September values.

Relative humidity averaged over all land areas declined quite sharply from the late 1990s to the mid 2000s. The average relative humidity for September was lower in 2017 than in all but two years in this data record. Relative humidity averaged over Europe is more variable, but also shows a net decline over time. Soil moisture exhibits a similar drying but there is no appreciable reduction in precipitation (not shown). The four months to September for NW Europe had above-normal anomalies in rainfall, but very small anomalies in relative humidity and soil moisture.



Running four-month averages of anomalies over NW Europe with respect to 1981-2010 for precipitation, the relative humidity of surface air, the volumetric moisture content of the top 7 cm of soil and surface air temperature, based on monthly values from January 1979 to September 2017.

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