



**Figure 1.1** | Multiple observed indicators of a changing global climate system. **(a)** Observed globally averaged combined land and ocean surface temperature anomalies (relative to the mean of 1986 to 2005 period, as annual and decadal averages) with an estimate of decadal mean uncertainty included for one data set (grey shading). [WGI Figure SPM.1, Figure 2.20; a listing of data sets and further technical details are given in the WGI Technical Summary Supplementary Material WGI TS.SM.1.1] **(b)** Map of the observed surface temperature change, from 1901 to 2012, derived from temperature trends determined by linear regression from one data set (orange line in Panel a). Trends have been calculated where data availability permitted a robust estimate (i.e., only for grid boxes with greater than 70% complete records and more than 20% data availability in the first and last 10% of the time period), other areas are white. Grid boxes where the trend is significant, at the 10% level, are indicated by a + sign. [WGI Figure SPM.1, Figure 2.21, Figure TS.2; a listing of data sets and further technical details are given in the WGI Technical Summary Supplementary Material WGI TS.SM.1.2] **(c)** Arctic (July to September average) and Antarctic (February) sea ice extent. [WGI Figure SPM.3, Figure 4.3, Figure 4.SM.2; a listing of data sets and further technical details are given in the WGI Technical Summary Supplementary Material WGI TS.SM.3.2]. **(d)** Global mean sea level relative to the 1986–2005 mean of the longest running data set, and with all data sets aligned to have the same value in 1993, the first year of satellite altimetry data. All time series (coloured lines indicating different data sets) show annual values, and where assessed, uncertainties are indicated by coloured shading. [WGI Figure SPM.3, Figure 3.13; a listing of data sets and further technical details are given in the WGI Technical Summary Supplementary Material WGI TS.SM.3.4]. **(e)** Map of observed precipitation change, from 1951 to 2010; trends in annual accumulation calculated using the same criteria as in Panel b. [WGI Figure SPM.2, TS TFE.1, Figure 2, Figure 2.29. A listing of data sets and further technical details are given in the WGI Technical Summary Supplementary Material WGI TS.SM.2.1]

Since the beginning of the industrial era, oceanic uptake of CO<sub>2</sub> has resulted in acidification of the ocean; the pH of ocean surface water has decreased by 0.1 (*high confidence*), corresponding to a 26% increase in acidity, measured as hydrogen ion concentration. There is *medium confidence* that, in parallel to warming, oxygen concentrations have decreased in coastal waters and in the open ocean

thermocline in many ocean regions since the 1960s, with a *likely* expansion of tropical oxygen minimum zones in recent decades. [WGI SPM B.5, TS2.8.5, 3.8.1, 3.8.2, 3.8.3, 3.8.5, Figure 3.20]