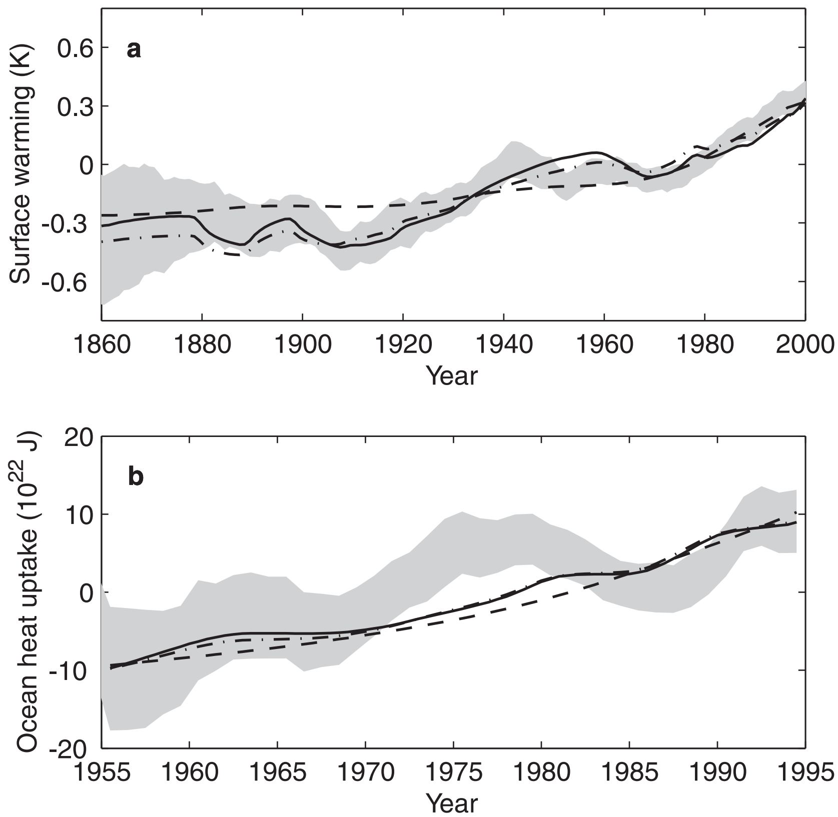
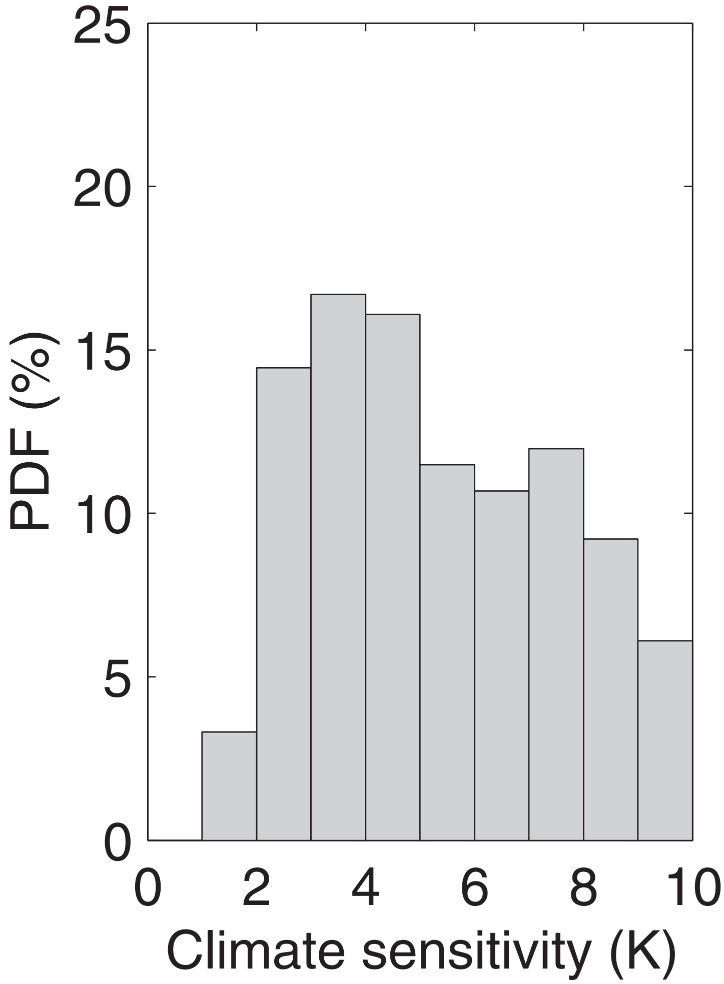
Supplementary material S07186A:

Knutti, R., T.F. Stocker, F. Joos, G.-K. Plattner, 2002, Constraints on radiative forcing and future climate change from observations and climate model ensembles. *Nature 416*, 719-723.



Supplementary Figure 1: Comparison of the observed and modelled surface warming and ocean heat uptake. (a) Modelled global mean surface air temperature increase (10-yr running mean) and (b) ocean heat uptake (5-yr running mean) for the standard model setup including anthropogenic and natural radiative forcing (solid), neglecting natural forcings (dashed) or neglecting the indirect aerosol forcing (dash-dotted). Climate sensitivities are chosen for each case to approximately match the observations (shaded bands) of surface warming and ocean heat uptake. The model reasonably reproduces the observed temporal evolution of global mean surface warming for the last 140 years with and without the indirect aerosol forcing. However, it has difficulties to reproduce the almost constant temperature between 1940 and 1970 and the strong warming after 1980, indicating that either the assumed radiative forcing is not correct, or that part of the observed temperature evolution is due to internal climate variability which is not resolved in this model. When the natural forcing is neglected, much of the variability in the surface warming is lost and the agreement is significantly worse. A similar picture is observed for the modelled ocean heat uptake, except that much less of the decadal structure in the data is reproduced. Variations in the ocean heat content due to unresolved processes like ENSO probably contribute to the observed variability.



Supplementary Figure 2: Climate sensitivity as constrained by the observed atmospheric/oceanic warming. The probability density function (PDF) for the climate sensitivity is obtained from 25,000 Monte Carlo simulations, taking into account uncertainties in the individual forcing components as well as uncertainties in ocean mixing, and requiring consistency with global values of observed surface warming and ocean heat uptake. The high climate sensitivities (>6 K) result from simulations with strongly negative indirect aerosol forcing.