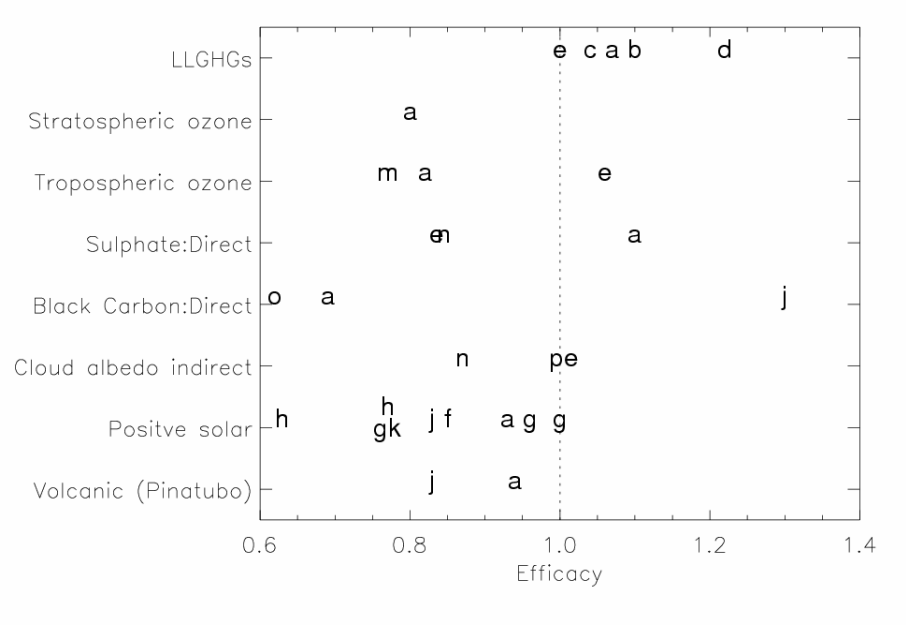


Figure 2.23 Efficacies as calculated by several GCM models for realistic changes in RF agents. Letters are centred on efficacy value and refer to the literature study that the value is taken from (see text of Section 2.8.5 for details and further discussion). Studies assessed in figure are: a) Hansen et al. (2005); b) Wang et al. (1991); c) Wang et al. (1992); d) Govindasamy et al. (2001); e) Lohmann and Feichter (2005); f) Forster et al. (2000); g) Joshi et al. (2003) (see also Stuber et al., 2001); h) Gregory et al. (2004); j) Sokolov (2006); k) Cook and Highwood (2004); m) Mickley et al. (2004); n) Rotstayn and Penner (2001); o) Roberts and Jones (2004); p) Williams et al. (2001a).

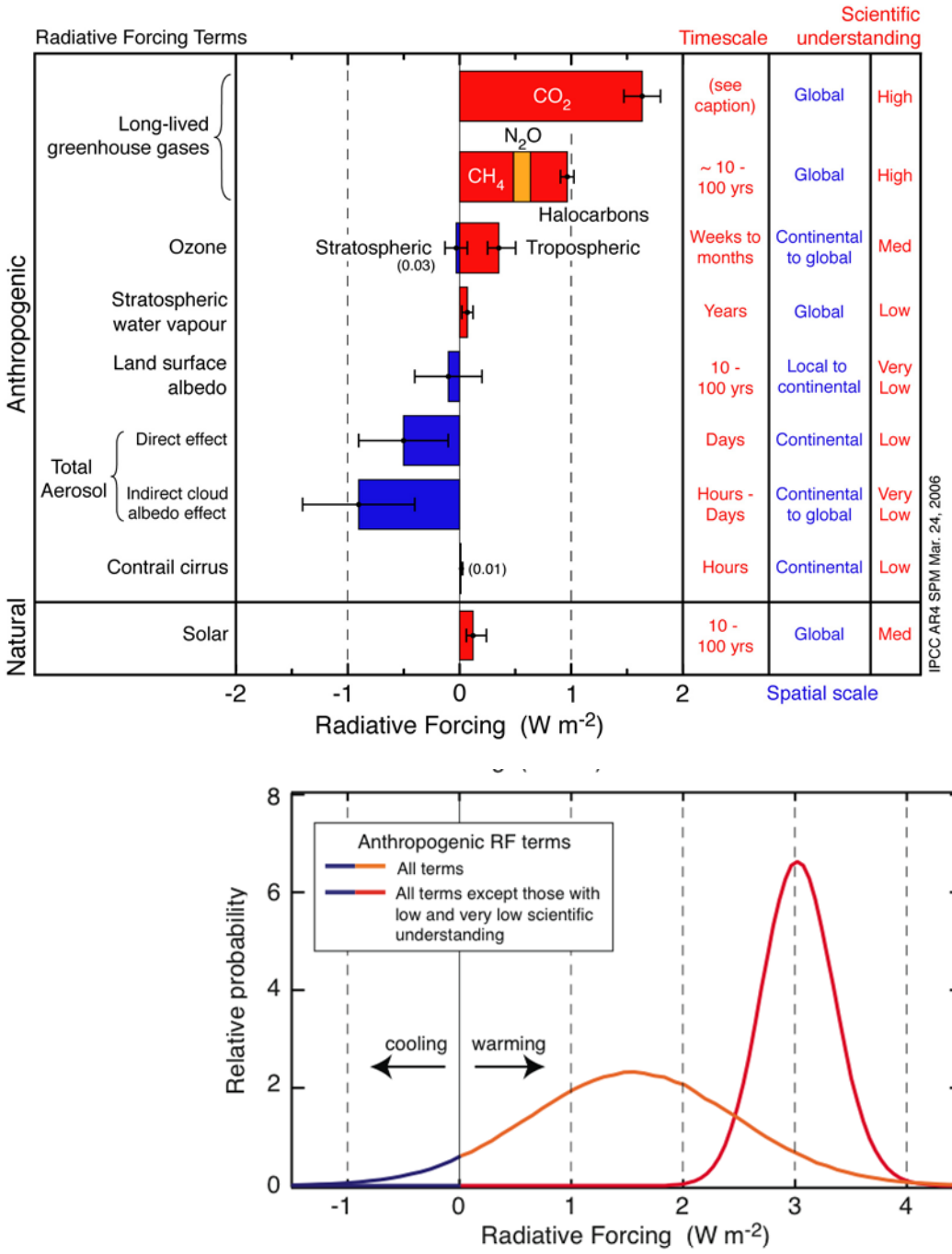


Figure 2.24. Top: Global mean RFs from the agents and mechanisms disused in this Chapter, grouped by agent type. Anthropogenic RFs and the natural direct solar RF are shown. RF values taken from bold values in Table 2.12. Columns indicate other characteristics of the RF; efficacies are not used to modify RFs. No CO2 timescale is given as its removal from the atmosphere involves processes that can span long timescales, and thus cannot be expressed accurately with a narrow range of lifetimes. Bottom: probability distribution of total global mean Anthropogenic RF terms, assuming uncertainty ranges on top figure correspond to 1σ confidence intervals and these errors are distributed as a Gaussian; efficacies are not accounted for. Two probality distributions are shown, one corresponding to mechanisms with high and medium levels of scientific understanding, ther other corresponding to all anthropgenic RF mechanisms evaluated in this Chapter. Methodology follows Boucher and Haywood (2001).

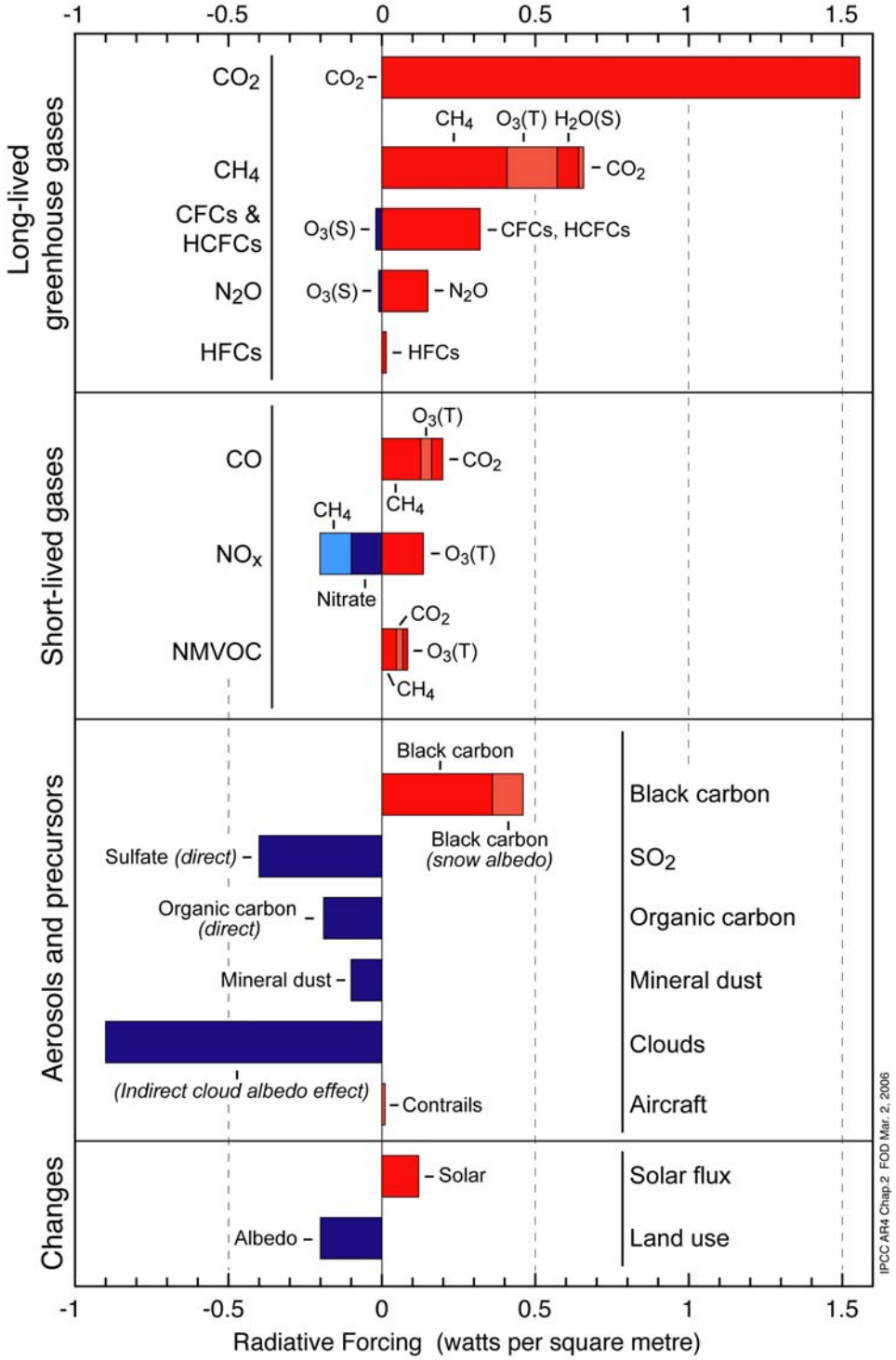


Figure 2.25. Components of radiative forcing for emissions of principal gases, aerosols and aerosol precursors and other changes. Values represent RF in 2004 due to emissions and changes since 1750. The uncertainties are given in the footnotes to Table 2.13

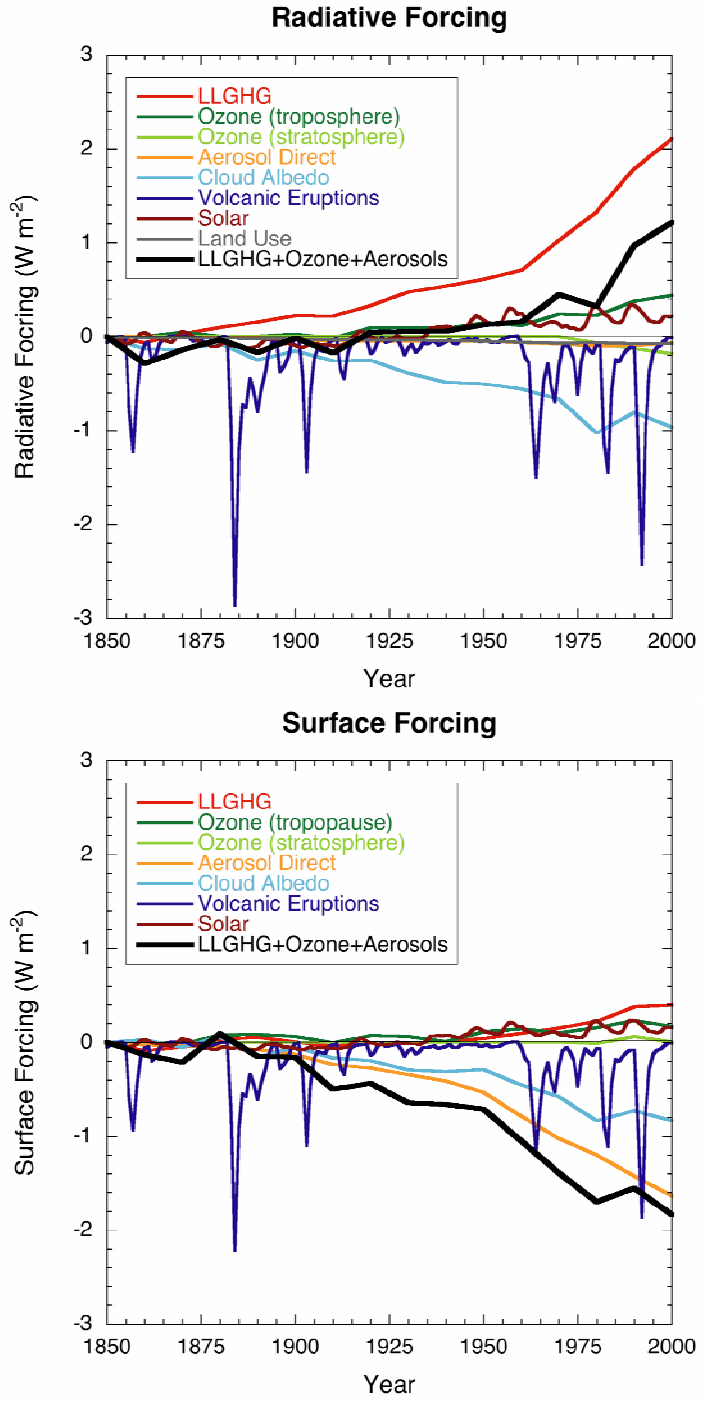


Figure 2.26. Globally-and-annually-averaged temporal evolution of the instantaneous all-sky RF (top panel) amd surface forcing (bottom panel) due to various agents, as simulated in the MIROC AOGCM (Takemura et al., 2005; Nozawa et al., 2005). This is an illustrative example of the forcings as implemented and computed in one of the climate models participating in the IPCC AR4. Note that there could be differences between models in their respective RFs, however most models have roughly similar evolution of the LLGHGs' RF. The response of the global-mean surface temperatures from the IPCC AR4 climate models is discussed in Chapter 10.

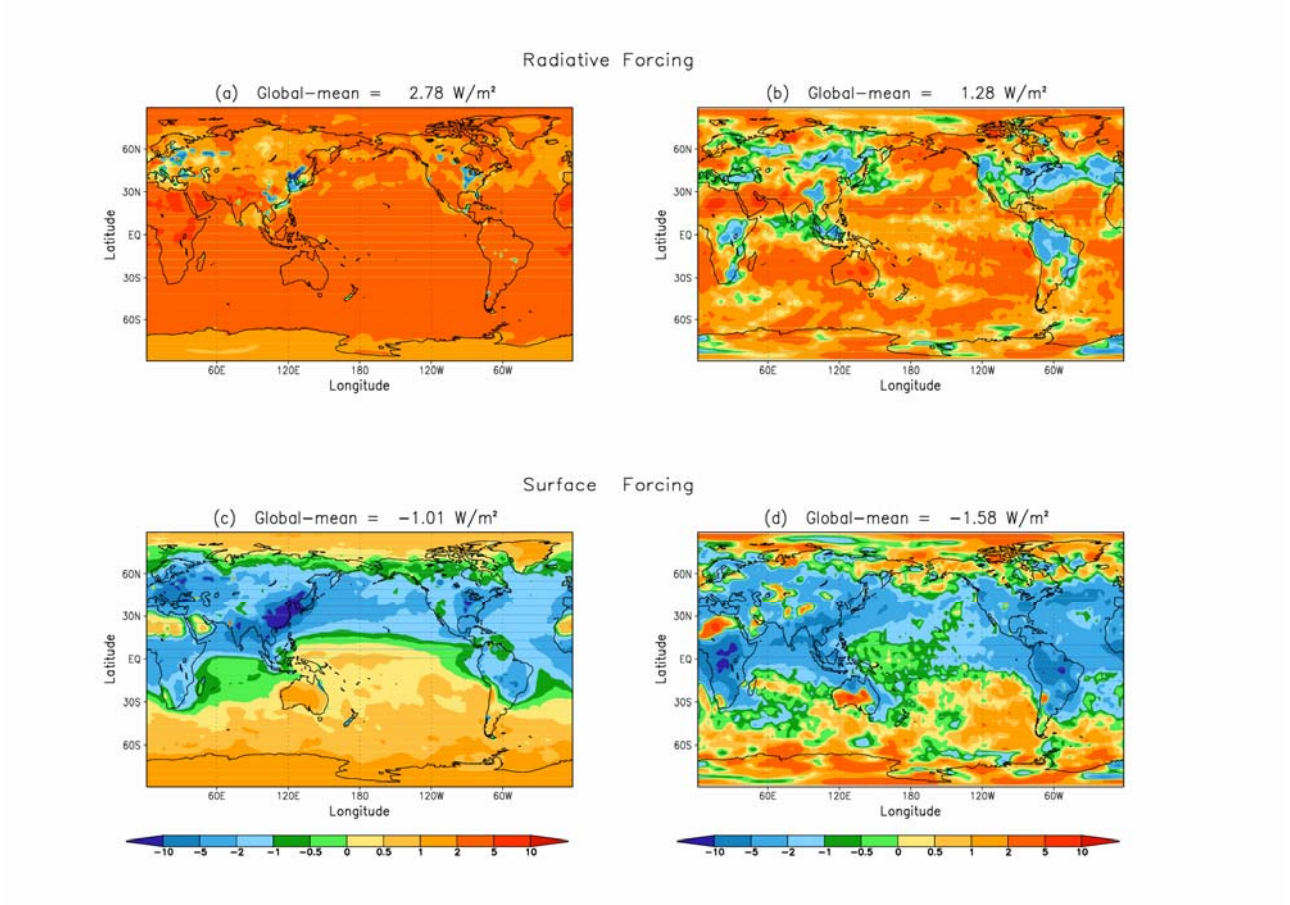


Figure 2.27. Instantaneous change in the spatial distribution of the net (solar+longwave) radiative flux due to natural-plus-antrhropogenic forcings between the years 2000 and 1860. Results here are intended to be illustrative examples of these quantities in 2 different climate models. (a) and (c) correspond to tropopause and surface results using the GFDL CM 2.1 model (adapted from Knutson et al., 2006). (b) and (d) correspond to tropopause and surface results using the CCSR-MIROC model (adapted from Nozawa et al., 2005 and Takemura et al., 2005). The instantaneous tropopause flux change is almost similar to the RF (see Section 2.2). Note that the MIROC model takes into account the aerosol 'cloud albedo' effect while the CM 2.1 model does not; this difference is manifest in the tropopause and surface forcing results from the two models.

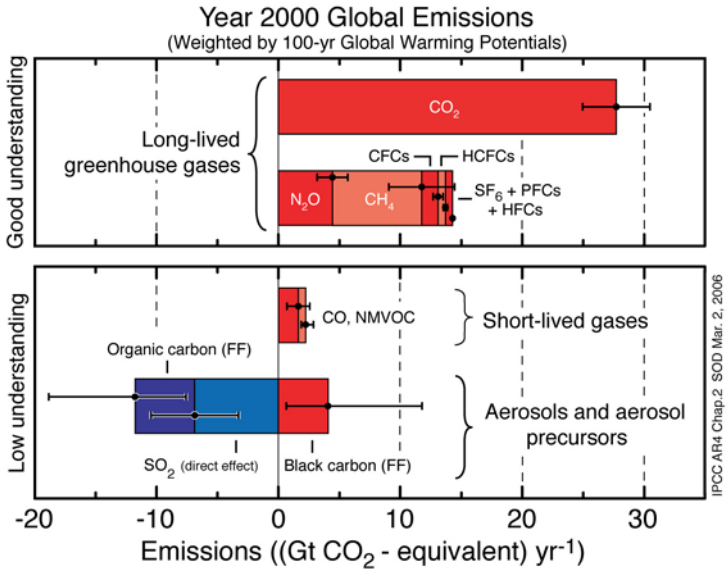
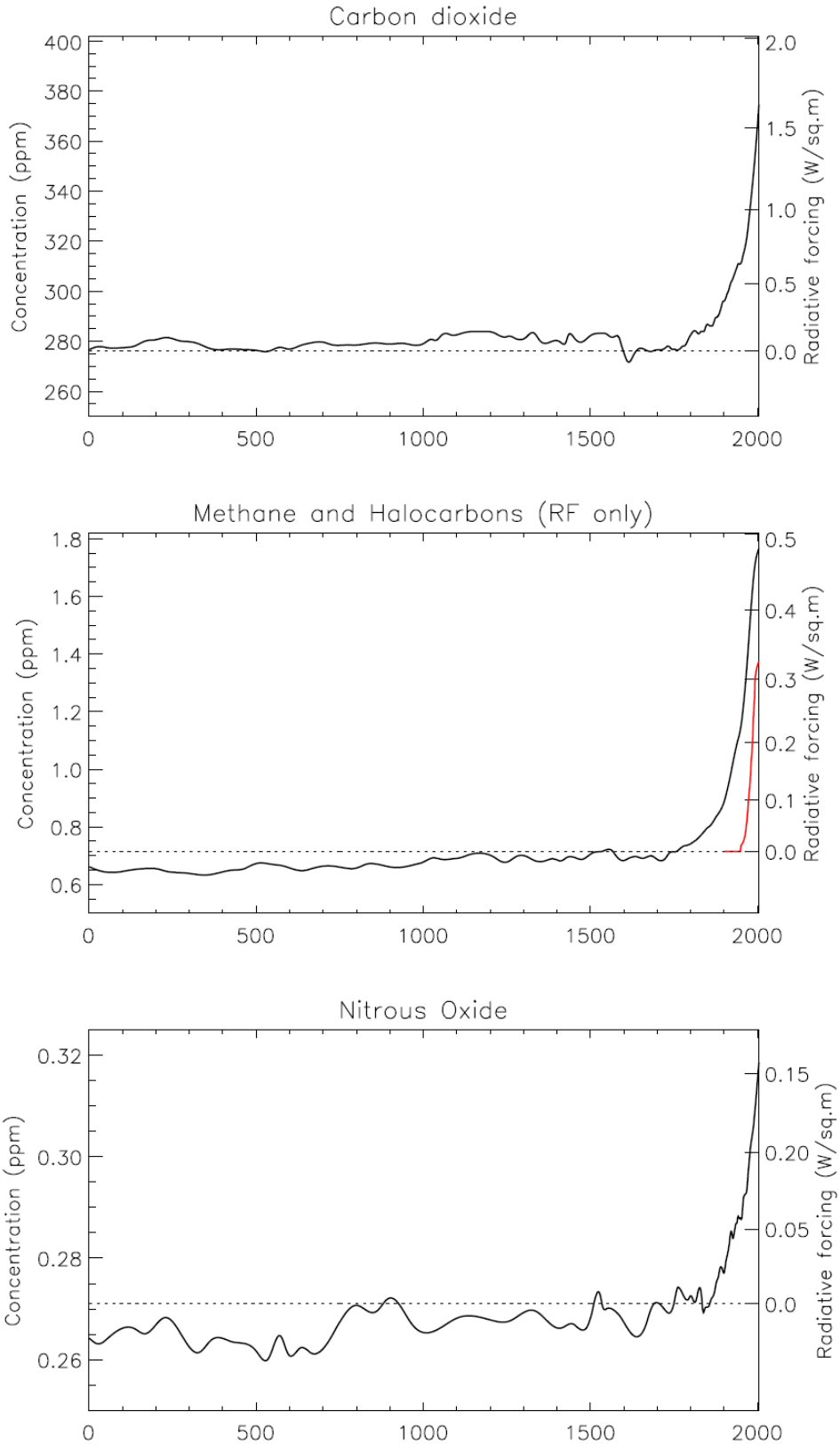
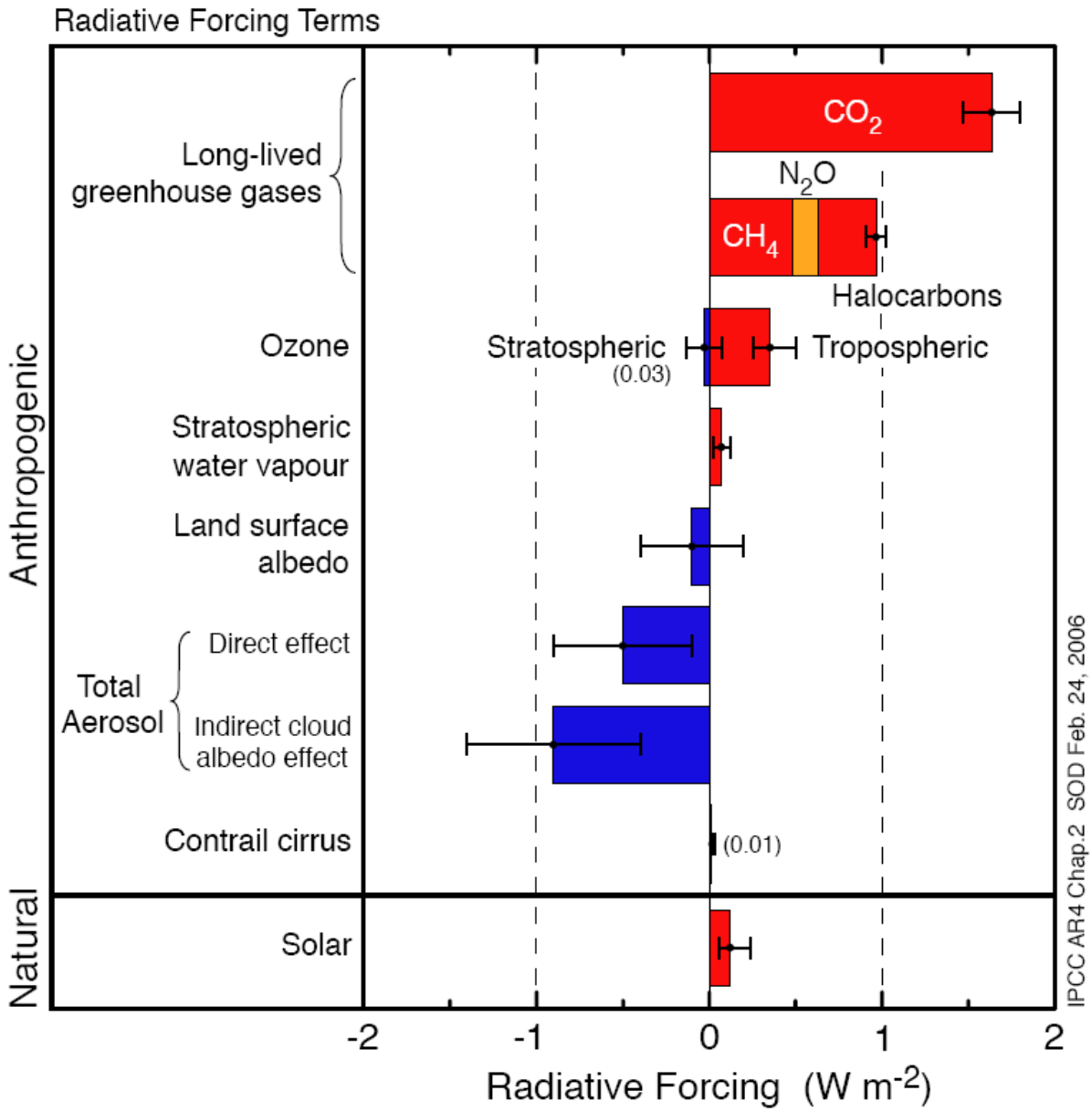


Figure 2.28. Year 2000 emissions weighted by 100-year GWPs. The figure gives an indication of the future climate impact of current emissions. A number of very important caveats are associated with this figure. In particular, short-lived gases and aerosol GWPs depend critically on both when and where they are emitted. The figure shows the global means. For OC and BC both fossil fuel and biomass burning emissions are included in the estimation of the GWPs and in the total emissions. The uncertainty estimates are based on both uncertainties in emission sources and the GWP estimate –these need to be carefully considered when comparing species.



Question 2.1, Figure 1. Atmospheric amounts of important greenhouse gases over the last 2000 years and their radiative forcing. Increases since ~1750 are attributed to human activities in the industrial era. (Data combined and simplified from Chapters 6 and 2 of this report).



Question 2.1, Figure 2. These radiative forcings result from climate change agents associated with both human activities and natural processes. The values represent the forcings in 2004 relative to start of the industrial era (about 1750). Human activities cause significant changes in long-lived gases, ozone, water vapor, land surface albedo, aerosols, and contrails. The only natural climate change agent is solar output. Positive forcings lead to warming of climate and negative forcings lead to a cooling. The thin black lines attached to each colored bar represents the range of uncertainty for the respective value. (Figure adapted from Figure 2.24 of this report.)