Opposing trends of cloud coverage over land and ocean under global warming

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Supplementary Information

1. Signal leakage analysis for the two dominant ST and TCC modes

Additional analysis was performed to check signal leakage for the two dominant EOF modes of ST and TCC (that are presented in the main text). Figure S1 presents the explained variance of all EOF modes and their correlations to the two dominant EOF modes and PCs.

It is evident that the explained variance by the first three EOF modes, in both ST (Fig. S1a) and TCC (Fig. S1D), is significantly larger than for the following modes. Moreover, the top two EOF modes (EOF1 and EOF2, Fig. S1B and S1E) and PCs (PC1 and PC2, Fig. S1C and S1F) for both ST and TCC show very weak similarities to other EOF modes and PCs. These results prove that signal leakage is not a major problem in the interpretation of the dominant modes of ST and TCC, as discussed in the main text.

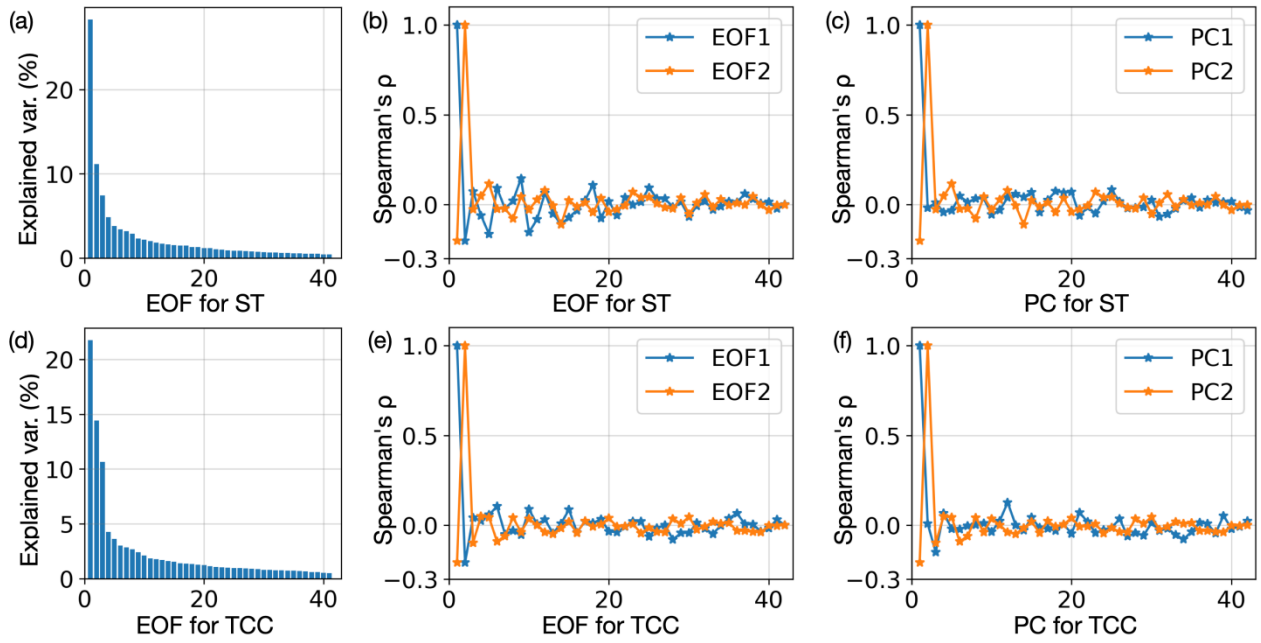

Figure S1: A signal leakage test for the top two EOF modes and PCs for ST and TCC. (a) Explained variance (unit: %) of all EOF modes for ST. (b) Correlations between the top two EOF modes and all EOF modes for ST. (c) Correlations between the top two PCs and all PCs for ST. (d–f) Same results as shown in (a–c), but for TCC.

2. Meteorological variables that correlate the second best with TCC

To identify additional important meteorological factors driving the TCC variation besides the dominant ones discussed in the main text, we show in Fig. S2 the geographical distribution of the second-best variables. These are the meteorological variables that correlate best with the TCC, after excluding the best-correlated variable that is presented in Fig. 4B in the main text. It shows that over land, no additional, prominent variable stands out for strong correlations with continental TCC.

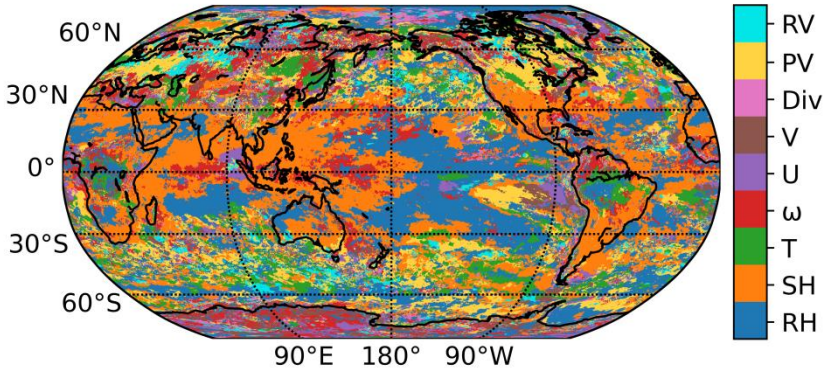

Figure S2: A map of the ERA5 meteorological variables that correlate second best (variable, per grid box, presented in Fig. 4B are not considered) with annual TCC data during 1979–2020. Only Spearman's ρ that are statistically significant at the level of 0.05 (p-value < 0.05, two-tailed t-test) are used.