Figure S1. Water mass formation regions of Red Sea and Persian Gulf Water in CMIP5 models and observations (WOA13). The colors indicate the deepest depth at each grid point, where the respective water mass properties are found.
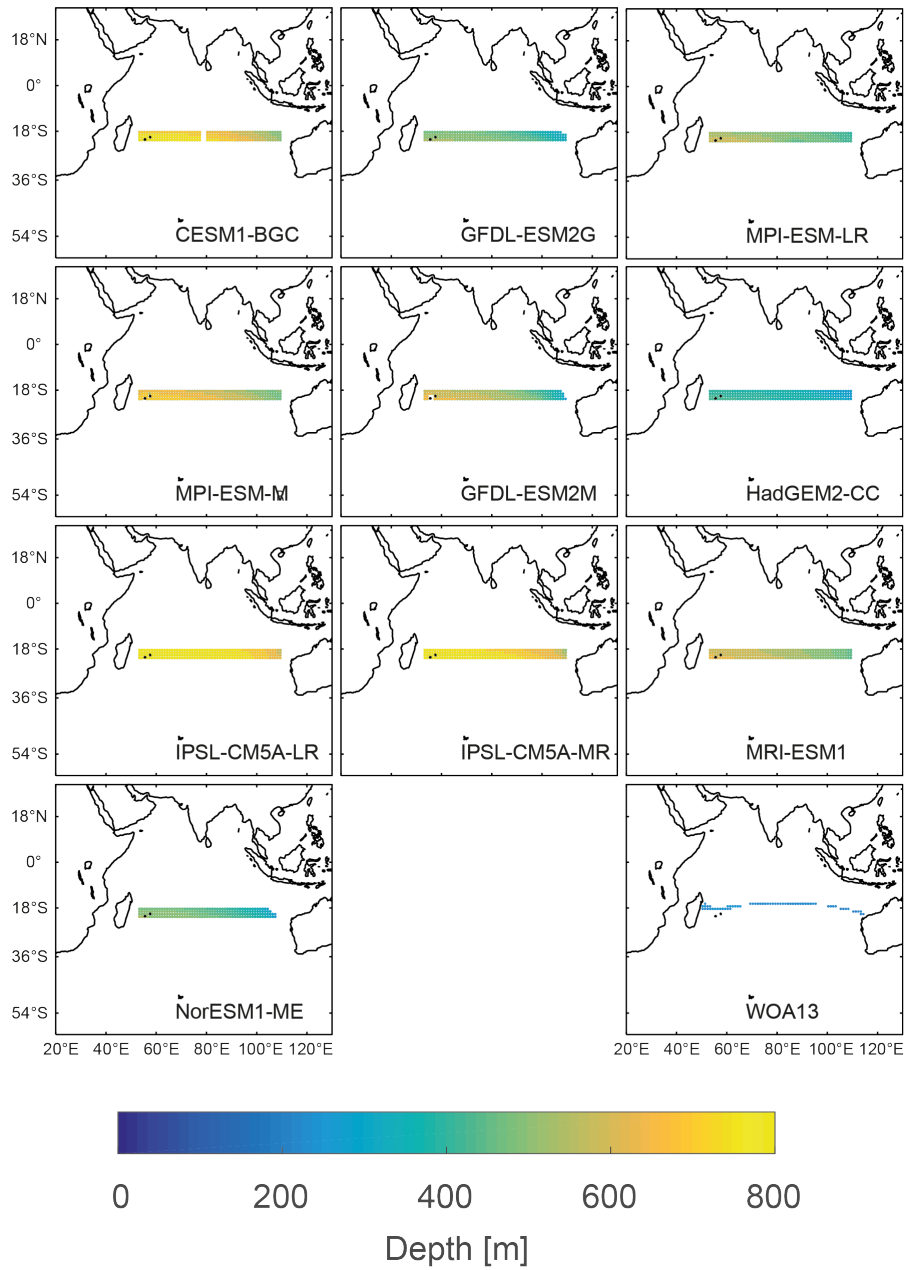
Figure S2. Water mass formation regions of Indian Central Water in CMIP5 models and observations (WOA13). The colors indicate the deepest depth at each grid point, where the respective water mass properties are found.
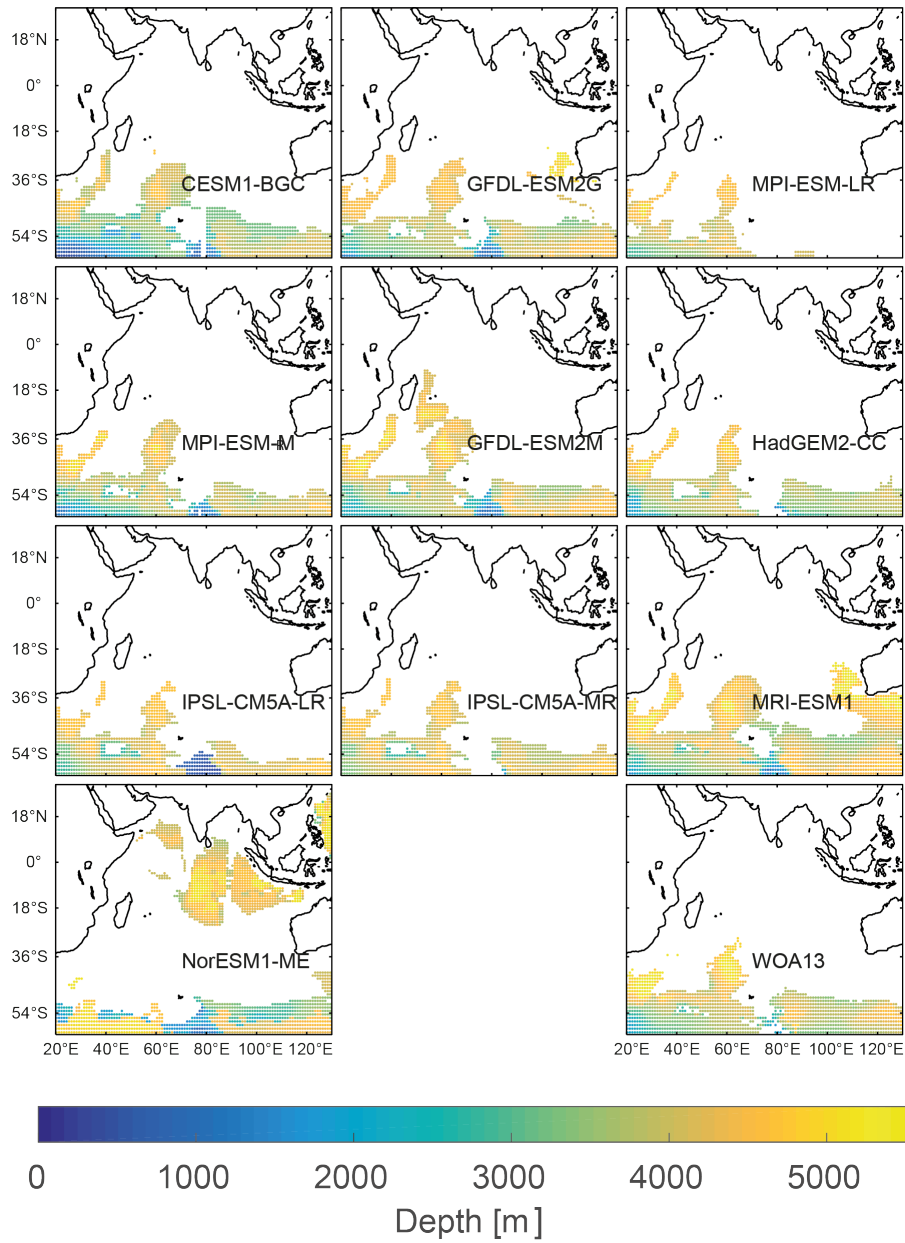
Figure S3. Water mass formation regions of Indian Ocean Deep Water in CMIP5 models and observations (WOA13). The colors indicate the deepest depth at each grid point, where the respective water mass properties are found.
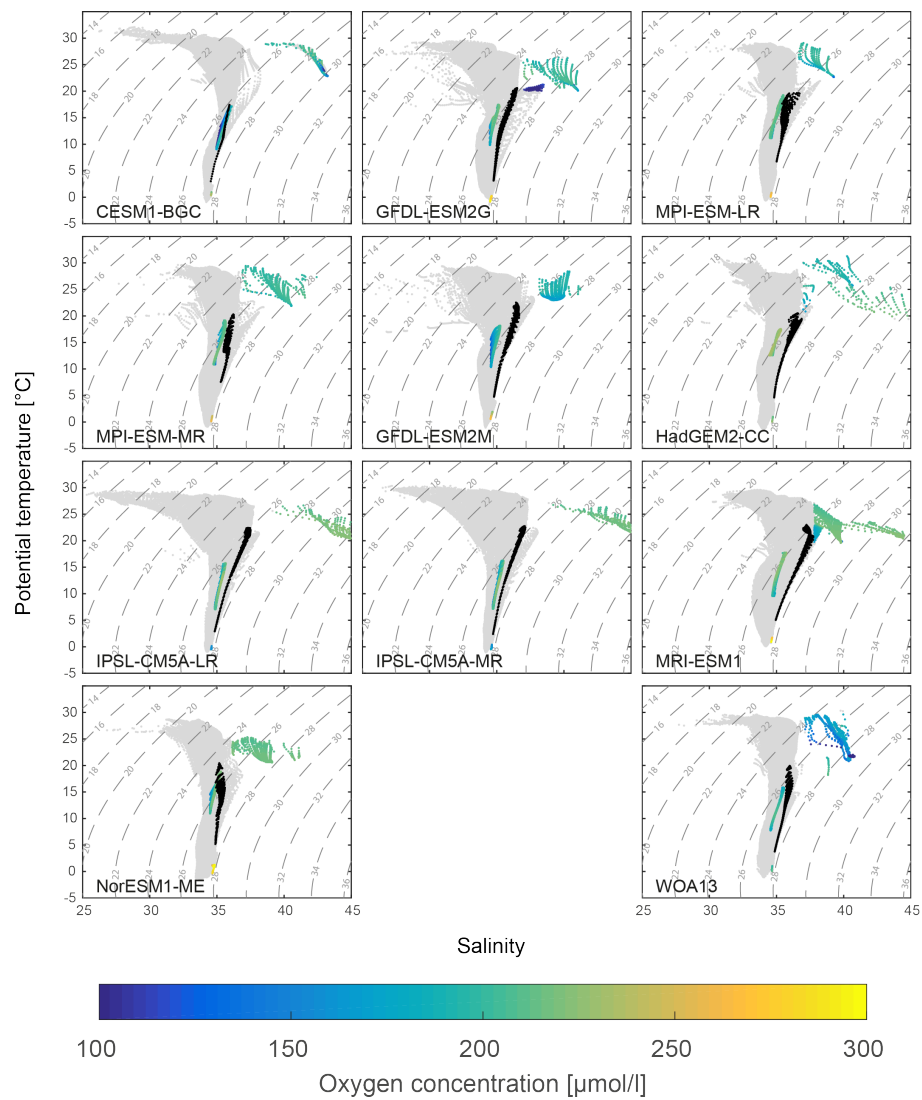
Figure S4. TS diagrams for the Indian Ocean (grey) for CMIP5 models and observations (WOA13). The color shading indicates the oxygen concentration of RSW and PGW, ICW and IODW. In black are the values in the ASOMZ.
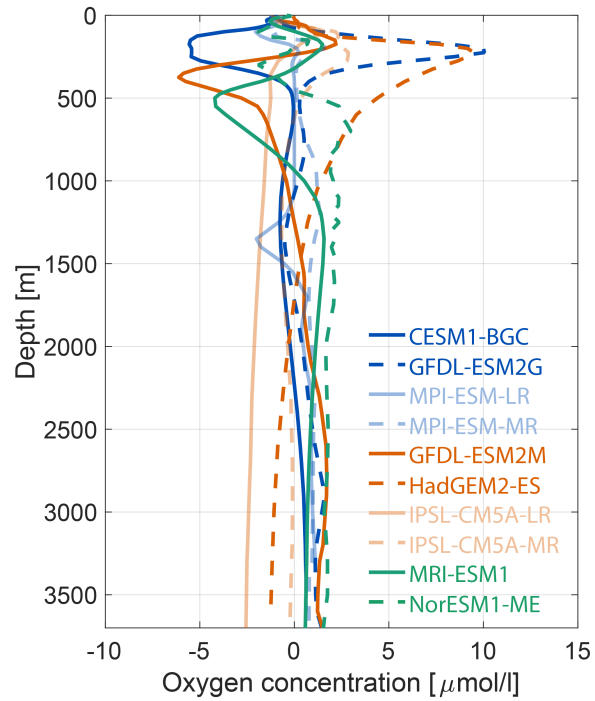
Figure S5. Difference of the averaged vertical oxygen concentration profiles from 1999-1950 minus 1949-1900 in the box between 16° and 22° N, 61° and 67° E in the Arabian Sea. Blue coloured models belong to oxygen cluster *HIGH*, red to cluster *MEDIUM* and green to clusters *LOW1* and *LOW2*.