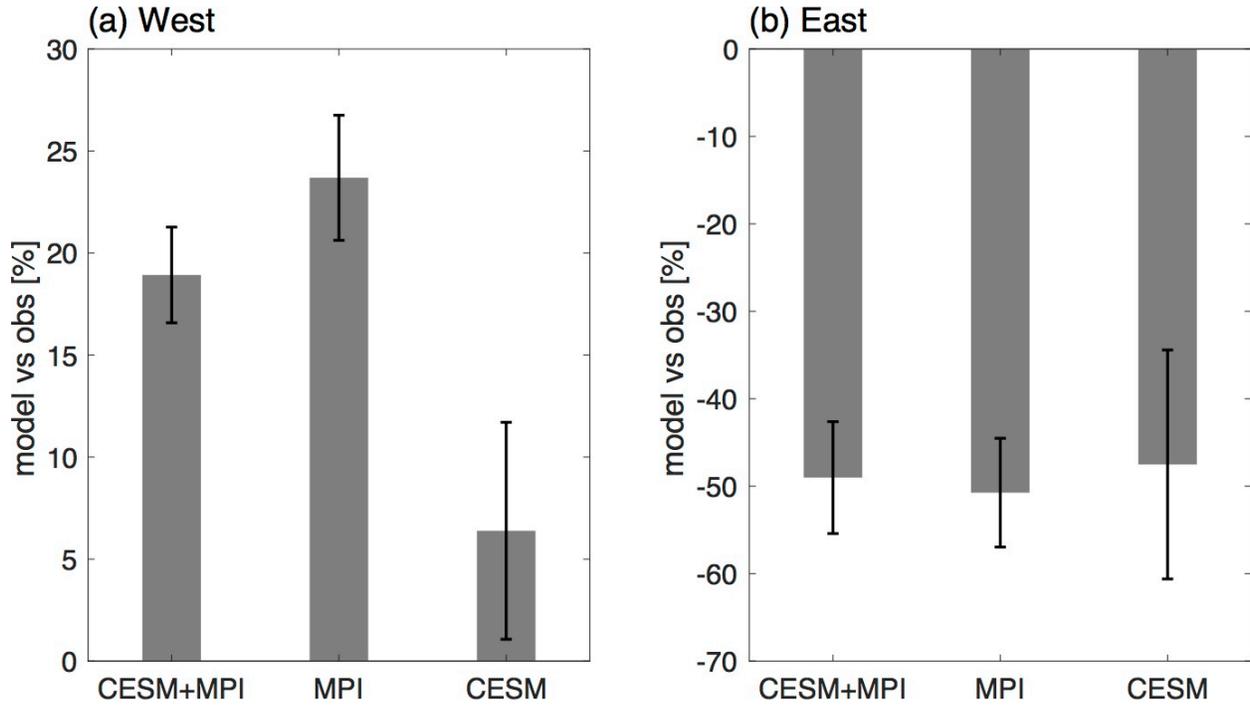**Supplementary Figures**

Fig. S1. Bar graph for the ratios (%) of linear trend and uncertainty of sea level from 1958-2005 between model ensemble mean and observation for the west Indian Ocean Seychelles area and east equatorial Indian Ocean (boxes of Fig. 2). The model ensemble means are for the 100 members that represent external forcing effect, using the 140 members from CESM1+MPI, 100 members from MPI and 40 members from CESM1, respectively; the observations are from the ORAS4 and SODA average. See Table 1 of the main text and Section 3.1 for details.
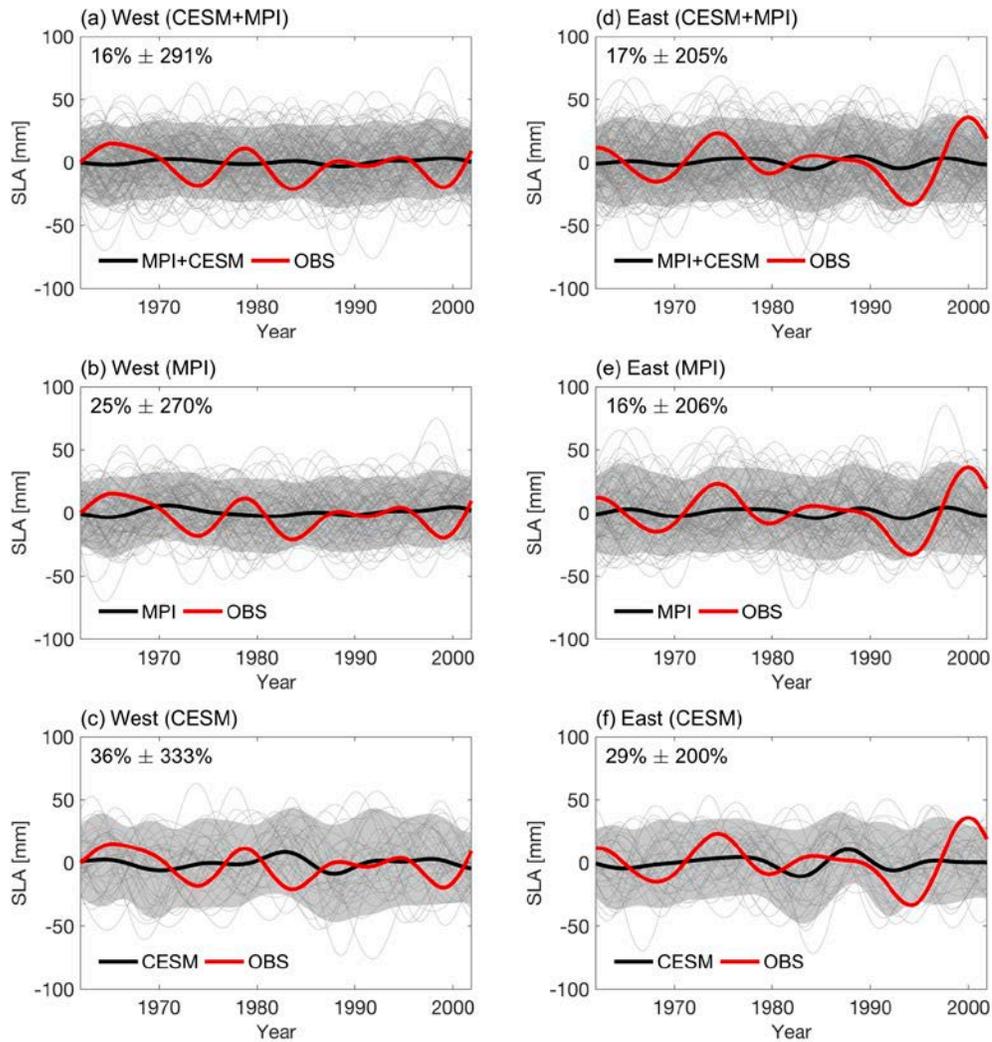
Fig. S2. Time series of 8yr lowpass filtered decadal SLA (mm) averaged over the Seychelles Island area in the west (Reg. 1 of Fig. 4) and near the ITF area in the east (Reg. 2 of Fig. 4) from observations and LE climate model simulations. (a) Time series of the 140 individual members from the MPI and CESM averaged in Reg. 1 (thin curves), their ensemble average representing external forcing (thick black curve), and the average of ORAS4 and SODA representing observation (red curve); the 16%±299% are the standard deviation (STD) ratio between external-forced and observed SLA and ensemble spread (1.65STD of 140-member spread, shown by the gray shading); since the global mean SLR has been removed, a significant portion of external forcing effect has been removed; consequently, external forcing on regional decadal SLA is small, and the variability is dominated by internal variability; in this case, the 16%±299% physically means that internal variability is way larger than external forcing, and the 299% can not be used to represent the "uncertainty" of external forcing; (b) and (c) are the same as (a) but for the MPI 100 members and CESM 40 members, respectively; (d)-(f) are the same as (a)-(c) except for averaged in Reg. 2.
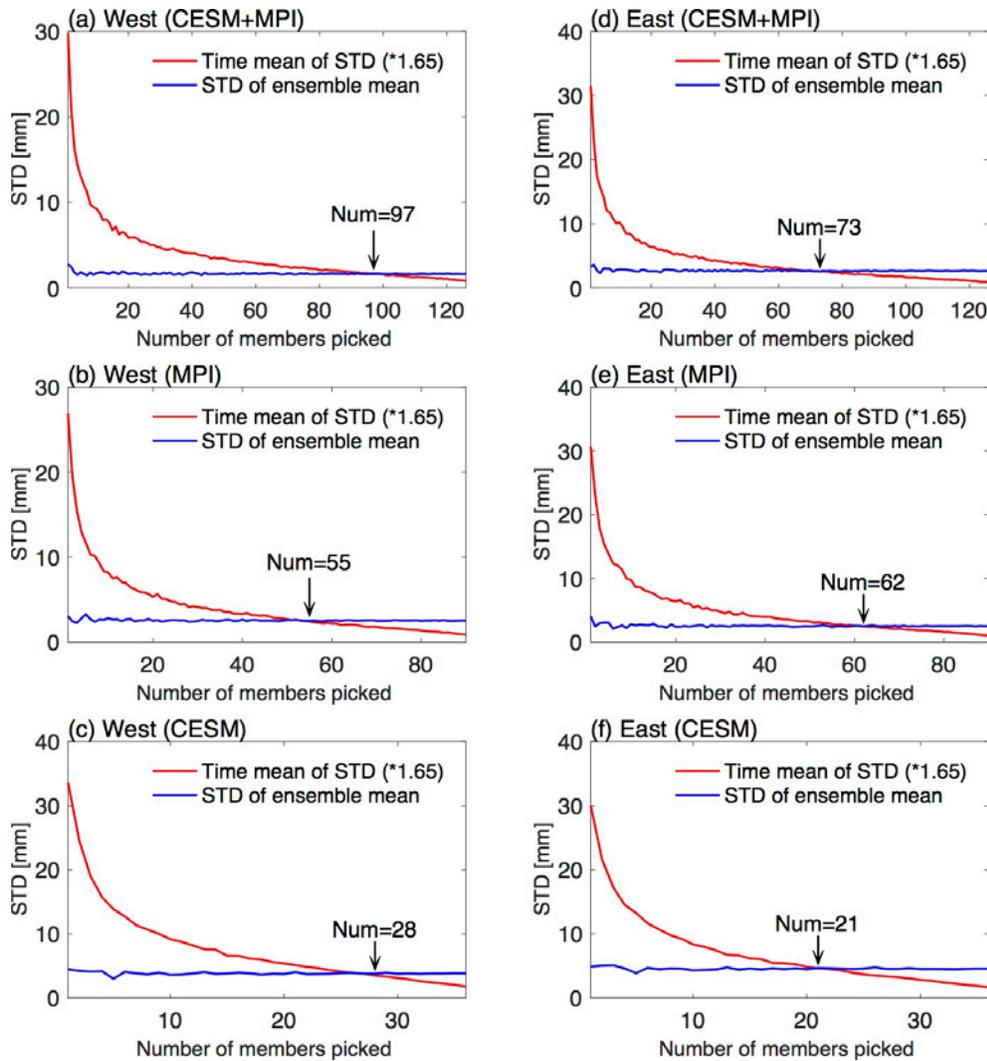
Fig. S3. (a)-(c): Line plot of the STD of decadal SLA (from 1962-2011) for the 100-member ensemble mean (blue curves) versus the chosen number (N) of ensemble members used in the Monteo Carlo method for the MPI+CESM1 (140 members), MPI (100 members), and CESM1 (40 members), respectively, over the west Indian Ocean Seychelles area; the red curve shows the corresponding 100-member spread (1.65STD) for a chosen N; (d)-(f) are the same as (a)-(c) but for the southeast Indian Ocean near the ITF area. To obtain this figure, we first randomly chose N members, for instance from the MPI 100-member ensemble, and then obtain the N-member ensemble average. In this way, we obtain a set of 100 ensemble members, with each being a N-member ensemble mean. Then we calculate the 100-member ensemble mean and obtain its STD for 1962-2011 (blue curve). The red curve is the 100-member spread (1.65STD) for each chosen N. The Number marked in each panel shows the first N value at which the red curve stays below the blue curve. Based on this figure, we see that by choosing N being 70% of the total ensemble members, i.e., 98 for (MPI+CESM1), 70 for MPI and 28 for CESM1, the 1.65STD spreads are smaller than the ensemble means in both the western and eastern Indian Ocean (red curves below the blue curves).