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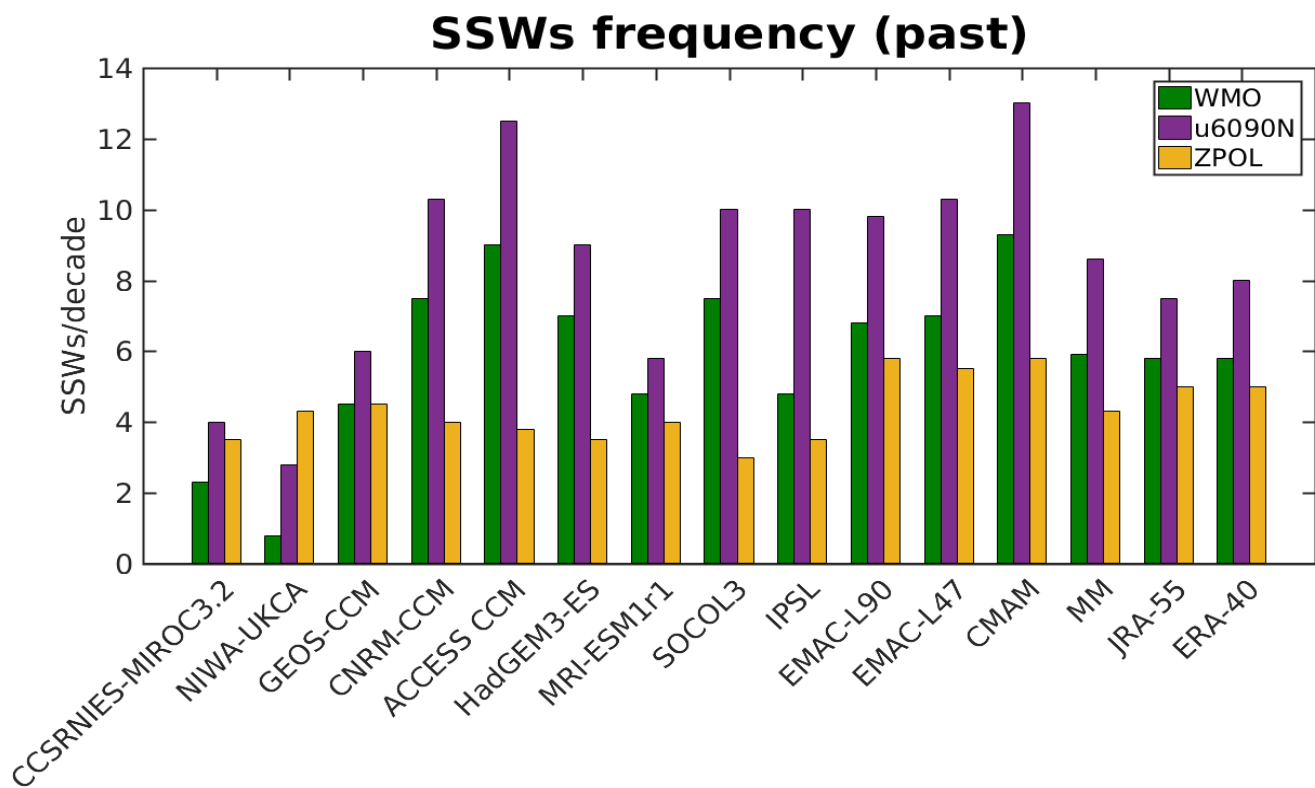
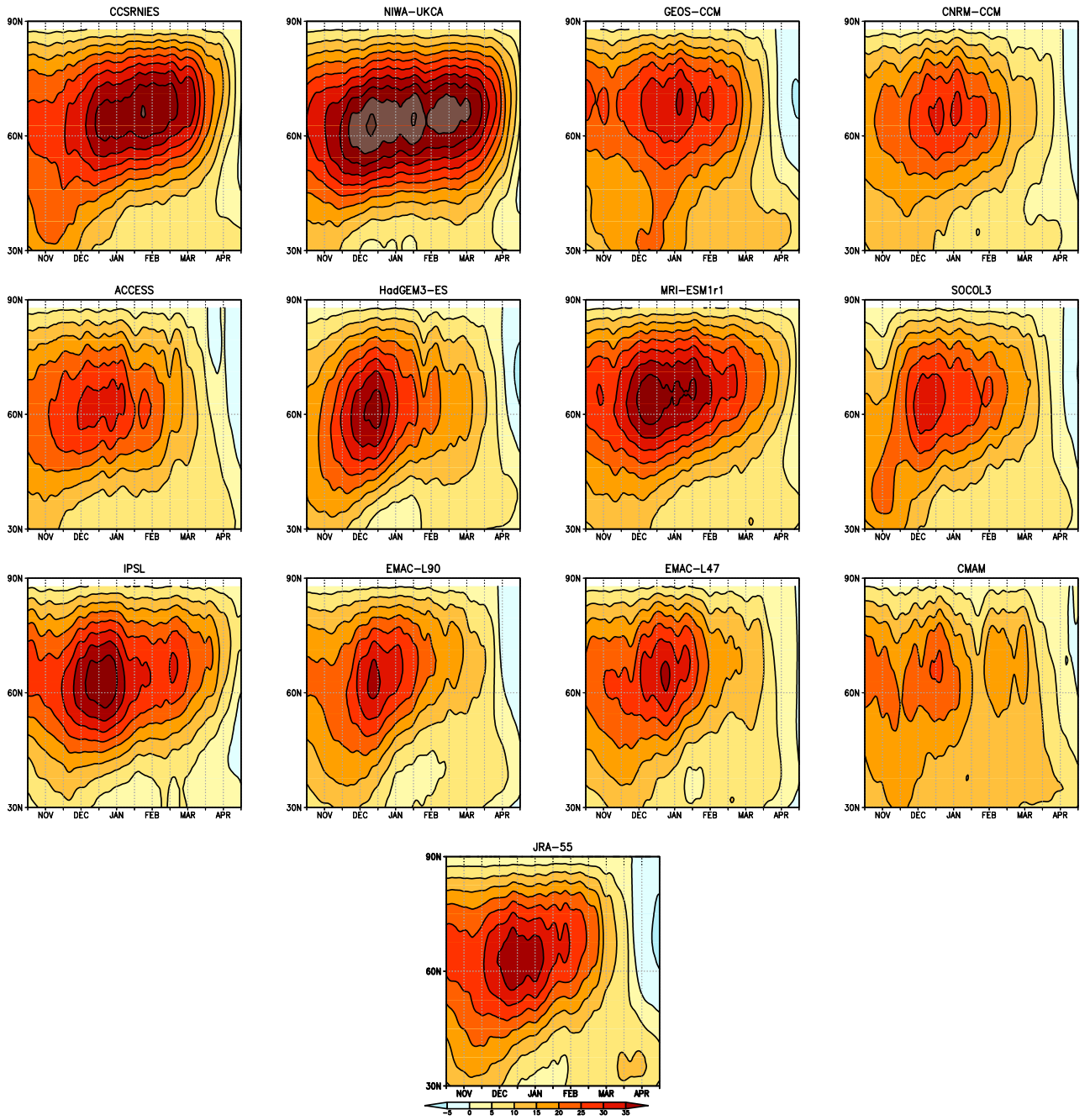


Figure S1. Mean frequency of stratospheric sudden warmings per decade identified with the WMO (green), u6090N (purple) and ZPOL (yellow) criteria in all models, the multimodel mean (MM), JRA-55 and ERA-40 in the past period.

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**Figure S2.** Climatology of 5-day running mean of zonal mean zonal wind at 10 hPa in the past period (1960/61-1999/2000). Shading interval:  $5 \text{ m s}^{-1}$ .

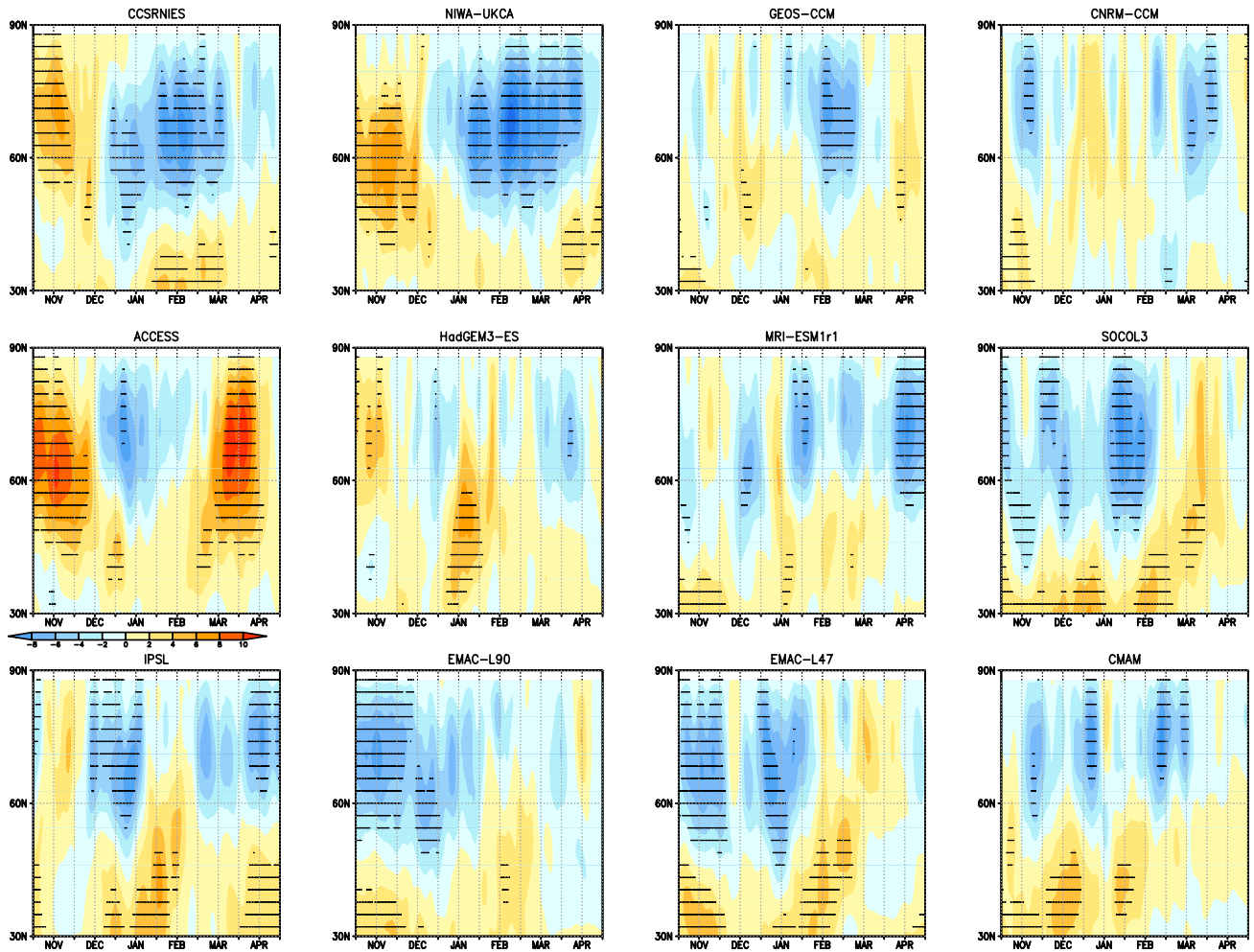
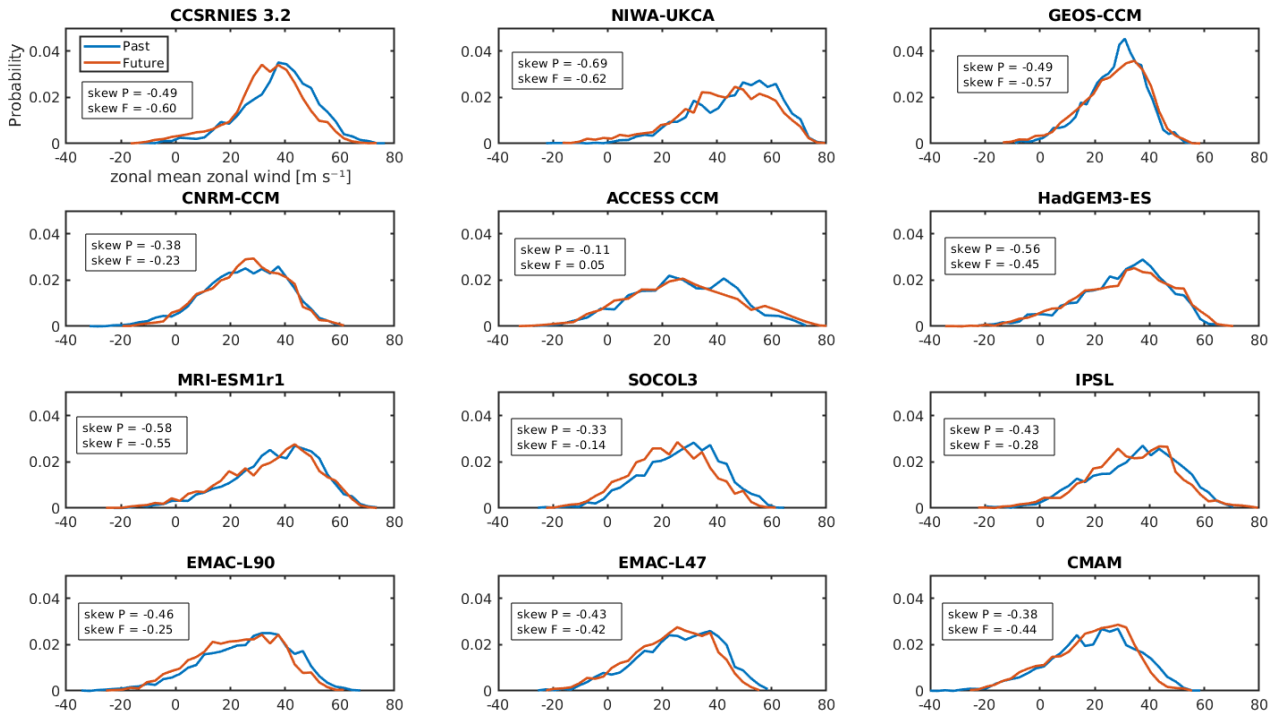


Figure S3. Future-minus-past differences in the climatology of 5-day running mean of zonal mean zonal wind at 10hPa. Shading interval:  $2 \text{ m s}^{-1}$ . Dots indicate statistically significant differences at a 95% confidence level.



**Figure S4. Probability distribution function of the daily zonal mean zonal wind at 60°N and 10hPa in December, January and February in the past (blue line) and future (orange line) for each CCMI model. The skewness of the distribution in each time period is indicated in the text boxes**