

Changes in the Southern Hemisphere atmospheric circulation in recent decades

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The circulation of the southern extratropics is very complex and varies according to a very broad scale of modes (e.g., Simmonds 2003, Simmonds and King 2004). The mode which explains most temporal variability is the Southern Annular Mode (SAM) (e.g., Marshall 2003), and the SAM is intimately tied up with transient eddies through complex wave-mean flow interactions (e.g., Rashid and Simmonds 2004, 2005). It has been suggested that trends in the SAM are associated with the increase in extent of Antarctic sea ice.

Over the period 1979-2013 the SAM has exhibited significant positive trends in summer (December – February) ($p < 0.05$) and autumn (March – May) ($p < 0.10$), but not in the other two seasons (Simmonds 2014). We here show the trends in the sea level pressure (SLP) over the southern extratropics calculated from the ERA-Interim reanalysis for the period 1979-2013. Fig. 1 shows, as expected, a very SAM-like signal in the summer pressure trends. In autumn similar significant shifts in the meridional SLP distribution may be seen in the Pacific, whereas an opposite signal is seen in the Atlantic and there are strong positive trends to the east of the Weddell Sea. In winter and spring one can appreciate from the Figure that there is little trend in the zonal means, but spring does show a significant increase between about 50 and 60°S to the northeast of the Weddell Sea. It will be noted that the pattern in spring resembles the Pacific-South American teleconnection pattern.

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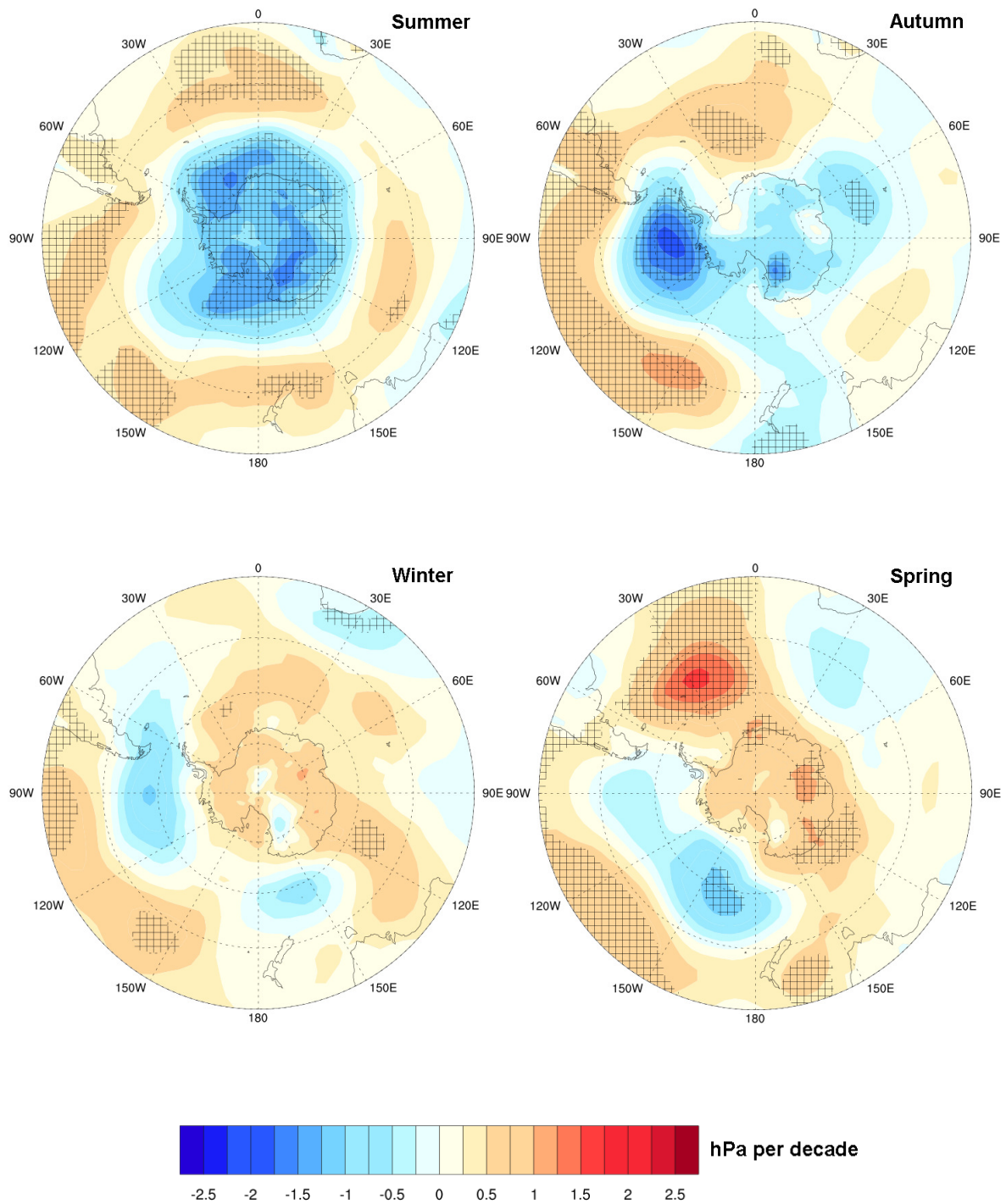


Fig. 1: SH extratropical SLP trends (1979 to 2013) for Summer, Autumn, Winter, and Spring for the period. The units are hPa per decade, and cross hatching denotes regions over which the trends differ significantly from zero at the 90% confidence level.