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Early twentieth century response of the global atmospheric electric circuit to ENSO

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The global atmospheric electric circuit links charge separation in disturbed weather regions with current flow in the fair weather regions elsewhere. Variations in disturbed weather, such as the changes in lightning associated with Pacific ocean temperature anomalies, can be expected in turn to modify currents flowing in the global atmospheric electric circuit. Strengthening and weakening of the global circuit current has been observed* to follow El Niño and La Niña respectively, from northern hemisphere atmospheric electricity data obtained during the 1970s. Extending this relationship quantitatively into the first half of the twentieth century is pursued here, using surface data from multiple atmospheric electricity observatories including measurements from the southern hemisphere. The independent atmospheric electricity time series from the observatories show similar variations, which is a pre-requisite for inferring global circuit variations from surface measurement. Combining the measurements allows the global circuit sensitivity to ENSO sea surface temperature anomalies to be derived during the earlier part of the twentieth century.

* R.G. Harrison, M. Joshi, K. Pascoe, Inferring convective responses to El Niño with atmospheric electricity measurements at Shetland Environ Res Lett 6 (2011) 044028 http://iopscience.iop.org/1748-9326/6/4/044028/