Cyclonic systems experiencing explosive development (ED), also known as meteorological 'bombs', are characterised by a reduction of central pressure at the rate of 24 hPa in 24 hours, relative to 60 degrees of latitude. Explosive cyclones are of concern to regions of Australia, New Zealand and South America as general features associated with these systems include destructive winds, flooding rains and coastal storm surges.

This study presents the first analysis of the Lorenz energetics associated with Southern Hemisphere explosive cyclones. A traditional and compact way to study the energetics of the atmosphere is adopted, whereby the kinetic and available potential energies are partitioned into zonal and eddy components. Energy budgets are calculated for climatologies of explosive cyclones within two regions, the Southwest Pacific and the South Atlantic.

Marked environmental changes in the Lorenz energy cycle are observed surrounding the period of ED. A peak in the conversion of zonal available potential energy to zonal kinetic energy precedes ED, maximized between 350 and 550 hPa. Sharp maxima in the baroclinic conversion terms closely follow ED at similar vertical levels, indicating the growth of eddy kinetic energy at the expense of available potential energy. Remarkably, the spatial signatures of the conversion terms for the two regions are virtually the same.

We explore whether a robust signature can be attributed to this class of cyclones regardless of geographical location or time of occurrence. The results open new avenues of exploration in both climatology and climate prediction of explosive cyclone development.