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An overview of a cyclone phase space and its application to eastern Atlantic and Mediterranean hybrid cyclones

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Since its inception in 2001, a generalized cyclone phase space for objective classification of the structure of cyclones (Hart 2003) has been utilized in operations and research internationally, while being aggressively compared to other metrics for cyclone evolution (Kofron et al. 2010). The diagnostic continuum has been used to officially and unofficially declare transitions of subtropical, tropical, and extratropical status – including the post-season addition of cyclones not advised during the tropical cyclone season. In terms of research, the diagnostics have been used to produce: 1) climatologies of extratropical transition in all basins of the northern hemisphere (Evans and Hart 2003; Kitabatake 2008; Wood and Ritchie 2012); 2) a climatology of subtropical storms in the Atlantic (Guishard et al. 2009); 3) a diagnostic sensitivity in post-tropical evolution (Hart et al. 2006); and 4) objective cluster analysis of cyclone structure (Arnott et al. 2004). Finally, variants of the diagnostics have been used to identify the potential for previously undiagnosed tropical cyclones in the 19th and early 20th centuries in state of the art reanalysis datasets (Truchelut and Hart 2011; Truchelut et al. 2012). In this presentation, an overview of the cyclone phase space is given, including examples of the various types of cyclone transitions and climatologies described above. The talk concludes with an examination of cyclones significant to the Mediterranean region and the insight the phase space provides into their structure and predictability.