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Weather Regimes and cyclonic activity in the North Atlantic European region: present and future climates

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Damages associated with extratropical storms are amongst the most important natural hazards on Western Europe. Thus, in this work we analyse: (i) the relationships between several cyclone characteristics: intensity, depth, radius, cyclogenesis, cyclolysis, and total number of cyclones (identified by applying the Murray and Simmonds method to 6-hourly 850 hPa geopotential height); (ii) their links to four large-scale weather regimes (WRs) over a North Atlantic-European sector (NAE, 90W-30E, 20N-80N); and (iii) the projected changes for future climates under emission scenarios. Four WRs are identified by a 4-means clustering of the daily 500 hPa geopotential height fields (Blocking, Zonal or NAO+, Atlantic Ridge, and Greenland Anticyclonic). Furthermore, daily 500 hPa geopotential height from four CMIP3 simulations are clustered using the ERA centroids, for both the recent-past climate (1961-1990) and two future climates: 2021-2050 and 2069-2098. The impact of anthropogenic forcing on the cyclonic activity over the NAE sector is thereby quantified for each of the four weather regimes. Acknowledgments: this work is supported by European Union Funds (FEDER/COMPETE - Operational Competitiveness Programme) and by national funds (FCT - Portuguese Foundation for Science and Technology) under the project CLIPE (PTDC/AAC-CLI/111733/2009).