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The role of anomalous SST over the Southeastern North Atlantic in the explosive development of winter storm Xynthia

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In late February 2010 the extraordinary winter storm Xynthia affected parts of western Europe and caused severe damage. The storm was embedded in an uncommon large-scale atmospheric and boundary conditions prior and during its development, namely the enhanced sea surface temperatures (SST) within the entrainment zone of air masses, the unusual southerly position of the polar jet stream, and a remarkable split jet struc-ture in the upper troposphere. To analyse the processes that lead to the rapid intensifi-cation of this exceptional far southern originating storm (30°N), sensitivity studies re-garding the role of the SSTs and latent heat release are carried out with the regional cli-mate model COSMO-CLM. A control simulation with realistic observed SST shows that moist and warm air masses originating from the subtropical North Atlantic are involved to the cyclogenesis process and lead to the formation of a vertical tower of high potential vorticity (PV). Sensitivity studies with reduced SST or suppressed latent heat release reveal a weaker and partly retarded development of the cyclone, and a weakening of the PV-tower. The results indicate that diabatic processes have played a crucial role during the phase of rapid deepening and to the resulting deep core pressure of Xynthia.