

EGU21-13586, updated on 24 Oct 2021

<https://doi.org/10.5194/egusphere-egu21-13586>

EGU General Assembly 2021

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The role of consecutive extratropical cyclones Daniel, Elsa, and Fabien on drought busting during December 2019 in the Miño-Limia-Sil Hydrographic demarcation

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Three consecutive extratropical cyclones named Daniel, Elsa, and Fabien affected the northwest of the Iberian Peninsula during December 2019. In this region is located the Miño-Limia-Sil Hydrographic Demarcation (MLSHD), which includes part of Galicia, in Spain and the north of Portugal. The water resources of the MLSHD are of great importance for the socio-economic framework of both countries, particularly for the agricultural and livestock activities, tourism, and the production of electrical energy from renewable sources like the eolic and the hydroelectric. In this study was analysed the synoptic characteristics of these extratropical cyclones, particularly during the life cycle close to the Iberian Peninsula, when the greatest damages associated with strong winds and intense rainfall occurred. The storm Daniel was formed from a secondary low located to the west and close to the Iberian Peninsula during the afternoon of December 15. Nevertheless, Elsa was formed in the Gulf of Mexico and Fabian in the north Atlantic Ocean, then both crossed the north Atlantic Ocean to finally affect with intense rainfall that caused floods in the MLSHD from 18 to 21 December 2019. The moisture supplies from the tropical north Atlantic Ocean, revealed by the integrated water vapour transport favoured the intensification of all these systems. The consecutive impact of these systems provided great amounts of rainfall to the MLSHD, causing positive anomalies of the total accumulated rainfall for this month. An assessment of drought conditions through the SPI and the SPEI on time scales of 1, 3, 6, and 12 months exposed the role of these systems on drought busting in the MLSHD. Therefore, despite the negative impacts, these systems favoured a recovery of the hydrological conditions of the Demarcation. Our results confirm the importance of studying for a long study period the role of extratropical cyclones on hydrological conditions of the MLSHD.

Acknowledgements:

This study is supported by Fundação para a Ciência e a Tecnologia, Portugal (FCT), under project WEx-Atlantic (PTDC/CTA-MET/29233/2017).