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To what extent power production in Portugal is driven by precipitation?

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Although Portugal has high renewable energy potential, inter-annual climate variability can significantly constrain exploitation of renewable resources. Strong inter-annual variability, seasonality and irregularity of precipitation lead to direct and indirect impacts on water resources management, such as on energy production. The present study relates anomalously dry/wet years to the production of renewable energy (hydro, wind and photovoltaic) in Portugal over 1998-2011. The main objective is to assess the role of these extreme years on the national power production budget. For this purpose, precipitation time series recorded at three weather stations (Bragança, Lisboa and Beja), provided by European Climate Assessment & Dataset project, and energy production series, from Direção Geral de Geologia e Energia, are used. Several atmospheric variables, from the National Centers for Environmental Prediction - National Centre for Atmospheric Research reanalysis, are composited in order to characterize the large-scale atmospheric flow in the extreme years. The connections to the North Atlantic (NAO) and East Atlantic (EA) oscillations in the production of renewable energy are also assessed. The results highlight the key role played by precipitation on the total energy production in Portugal, which is significantly and positively correlated with hydropower and wind power productions. In the annual renewable energy production, the wet years reveal an increment of 57% with respect to dry years. Acknowledgments: This work was supported by FEDER (Fundo Europeu de Desenvolvimento Regional) - COMPETE (Programa Operacional Factores de Competitividade) Programme and by FCT (Fundação para a Ciência e a Tecnologia, Portugal) project STORMEx FCOMP-01-0124-FEDER-019524 (PTDC/AAC-CLI/121339/2010).