



Atmospheric rivers and climate change – Responses and impacts

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1. Introduction

Atmospheric Rivers (ARs) are relatively narrow regions of concentrated water vapor transported in the lower atmosphere [Fig. 1 and 2]. Extreme precipitation and flood events, with major socio-economic impacts in many locations around the world have been associated with the presence of an AR. In recent years, a strong relationship was found between Atmospheric Rivers (ARs) and extreme precipitation and floods across the western coast of the continents. ARs do not describe continuous moisture transport. Rather, they are continually evolving pathways that incorporate moisture from local convergence and evaporation along their track or, in some cases, from distant source regions in the tropics or subtropics.

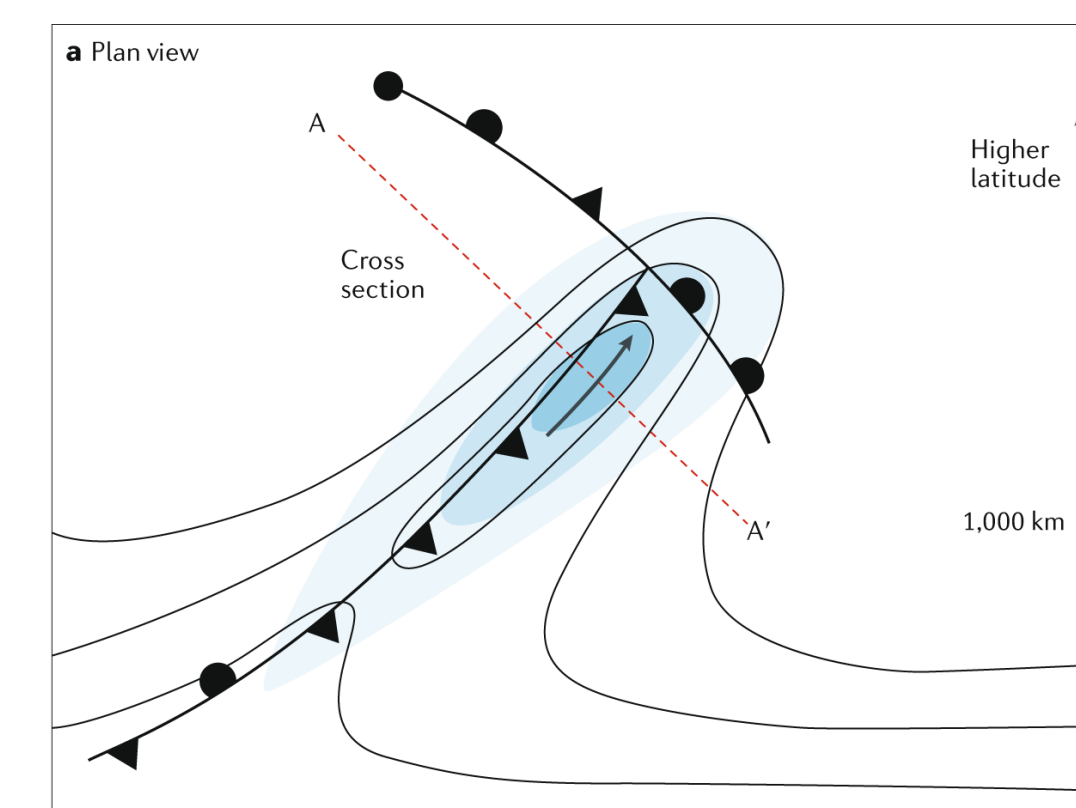


Fig.1. Typical structure and orientation of AR

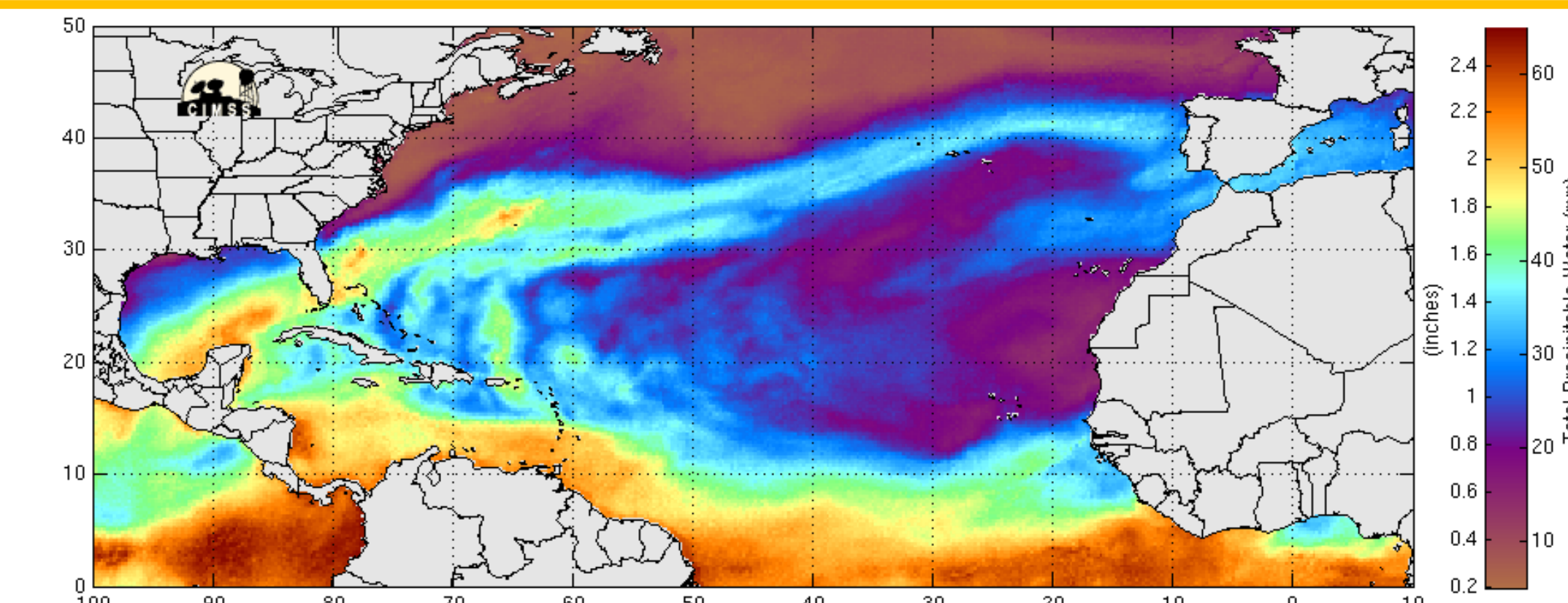


Fig. 2. Example of an AR in the Atlantic Region

2. Example of Impacts



Fig. 3. December 1909 - Porto

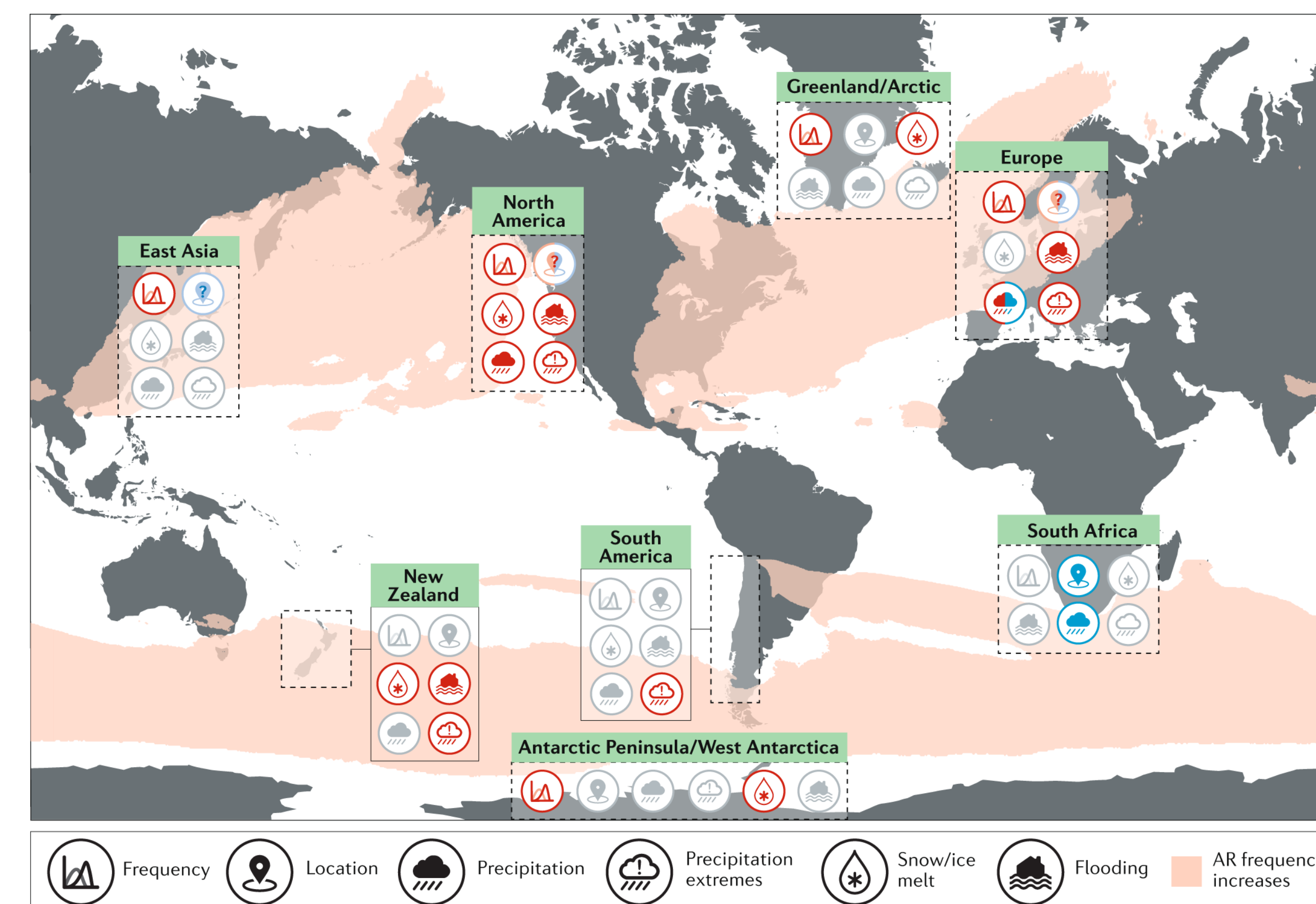


Fig. 4. February 2010 - Madeira



Fig. 5. December 2019 - Mondego

Fig. 6. Summary schematic of the main changes to AR characteristics and impacts under warming climate. Red and blue symbols reveal increases and decreases, respectively; for frequency, red refers to a poleward movement and blue an equatorward movement of landfall. Light red and blue symbols with ‘?’ indicate uncertainty in the projection. Grey symbols show unknown changes. Background shading illustrating AR frequency increases is based on Espinoza et al. 2018



Reference: Payne, A.E., Demory, M.; Leung, L.R.; **Ramos, A.M.**; Shields, C.A.; Rutz., J.J Siler, N.; Villarini, G.; Hall, A.; Ralph, F.M. (2020) Responses and impacts of atmospheric rivers to climate change. **Nature Reviews Earth & Environment**, 1, 143–157. Doi:10.1038/s43017-020-0030-5

Acknowledgments: This work was supported by the project “Weather Extremes in the Euro Atlantic Region: Assessment and Impacts—WEx-Atlantic”(PTDC/CTA-MET/29233/2017) funded by Fundação para a Ciência e a Tecnologia, Portugal (FCT). Alexandre. M. Ramos was also supported by the Scientific Employment Stimulus 2017 from FCT (CEECIND/00027/2017).