

Article

Comparing Remote Sensing and Geostatistical Techniques in Filling Gaps in Rain Gauge Records and Generating Multi-Return Period Isohyetal Maps in Arid Regions— Case Study: Kingdom of Saudi Arabia

Ahmed M. Helmi ^{1,*}, Mohamed I. Farouk ^{2,3}, Raouf Hassan ^{2,4}, Mohd Aamir Mumtaz ², Lotfi Chaouachi ² and Mohamed H. Elgamal ²

¹ Irrigation and Hydraulics Department, Faculty of Engineering, Cairo University, Giza 12613, Egypt

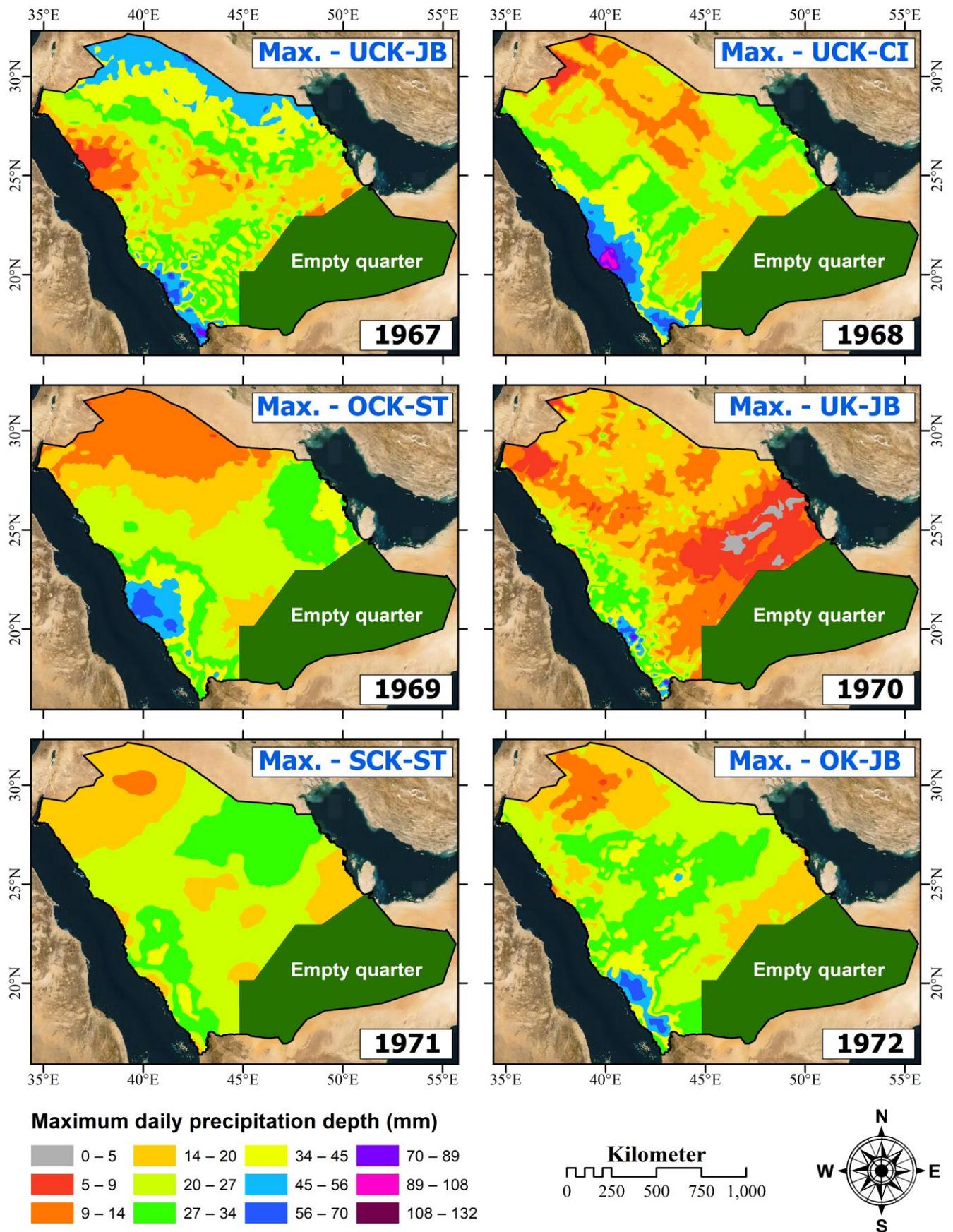
² Civil Engineering Department, College of Engineering, Imam Mohammad Ibn Saud Islamic University (IMSIU), Riyadh 13318, Saudi Arabia; miradi@imamu.edu.sa (M.I.F.); rahassan@imamu.edu.sa (R.H.); mmaamir@imamu.edu.sa (M.A.M.); lotfich64@gmail.com (L.C.); mhelgamal@imamu.edu.sa (M.H.E.)

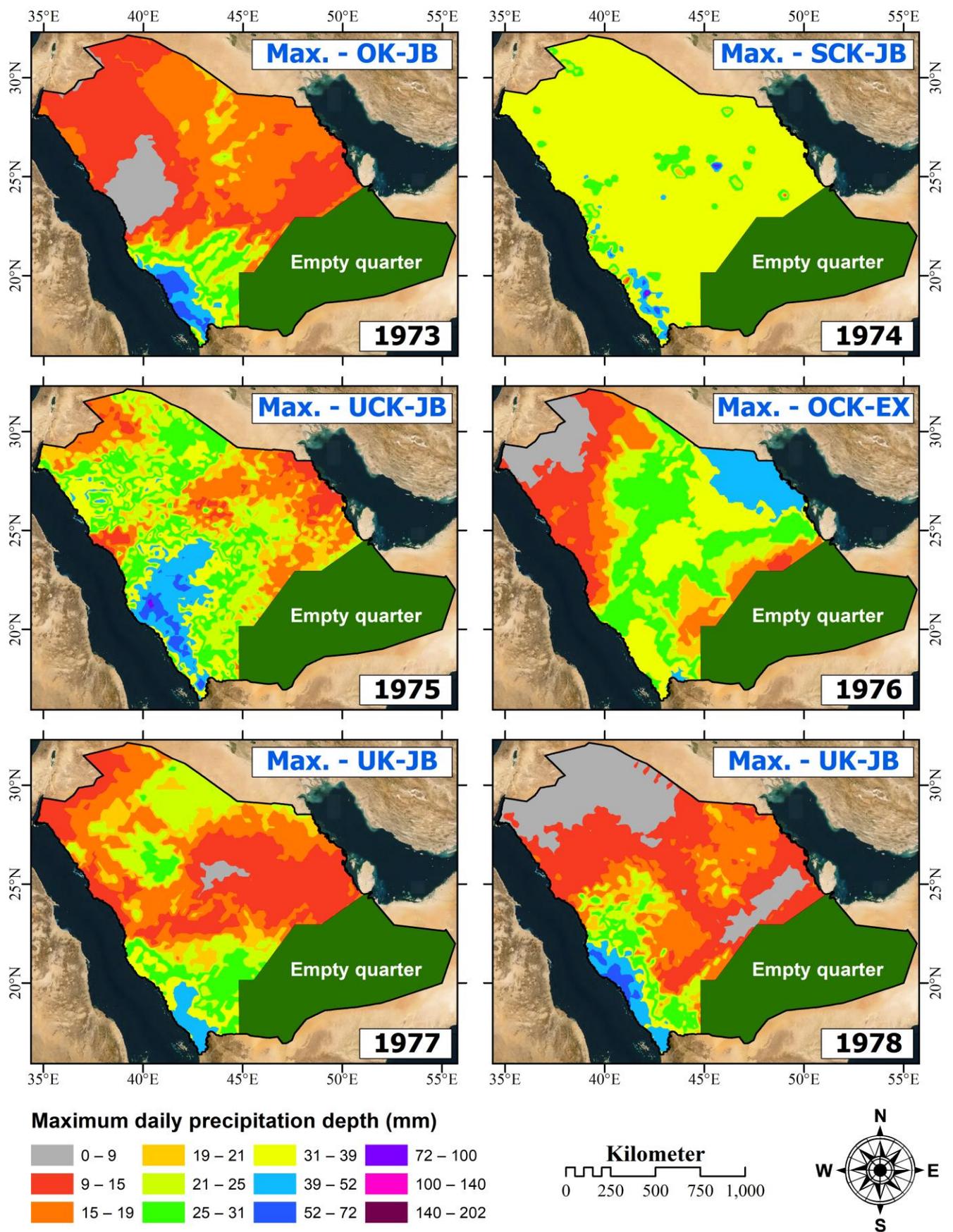
³ Irrigation and Hydraulics Department, Faculty of Engineering, Ain Shams University, Cairo 11517, Egypt

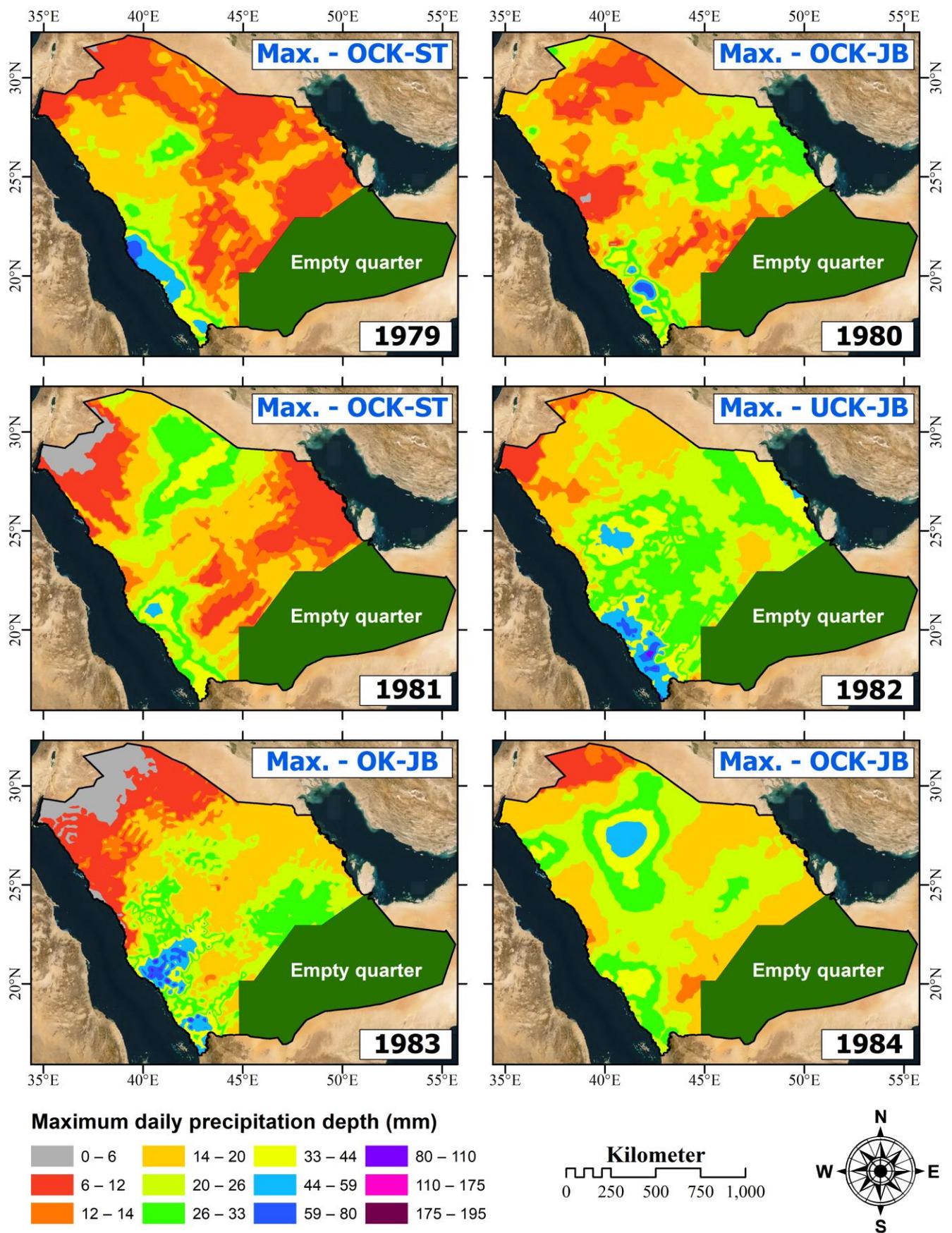
⁴ Civil Engineering Department, Faculty of Engineering, Aswan University, Aswan 81542, Egypt

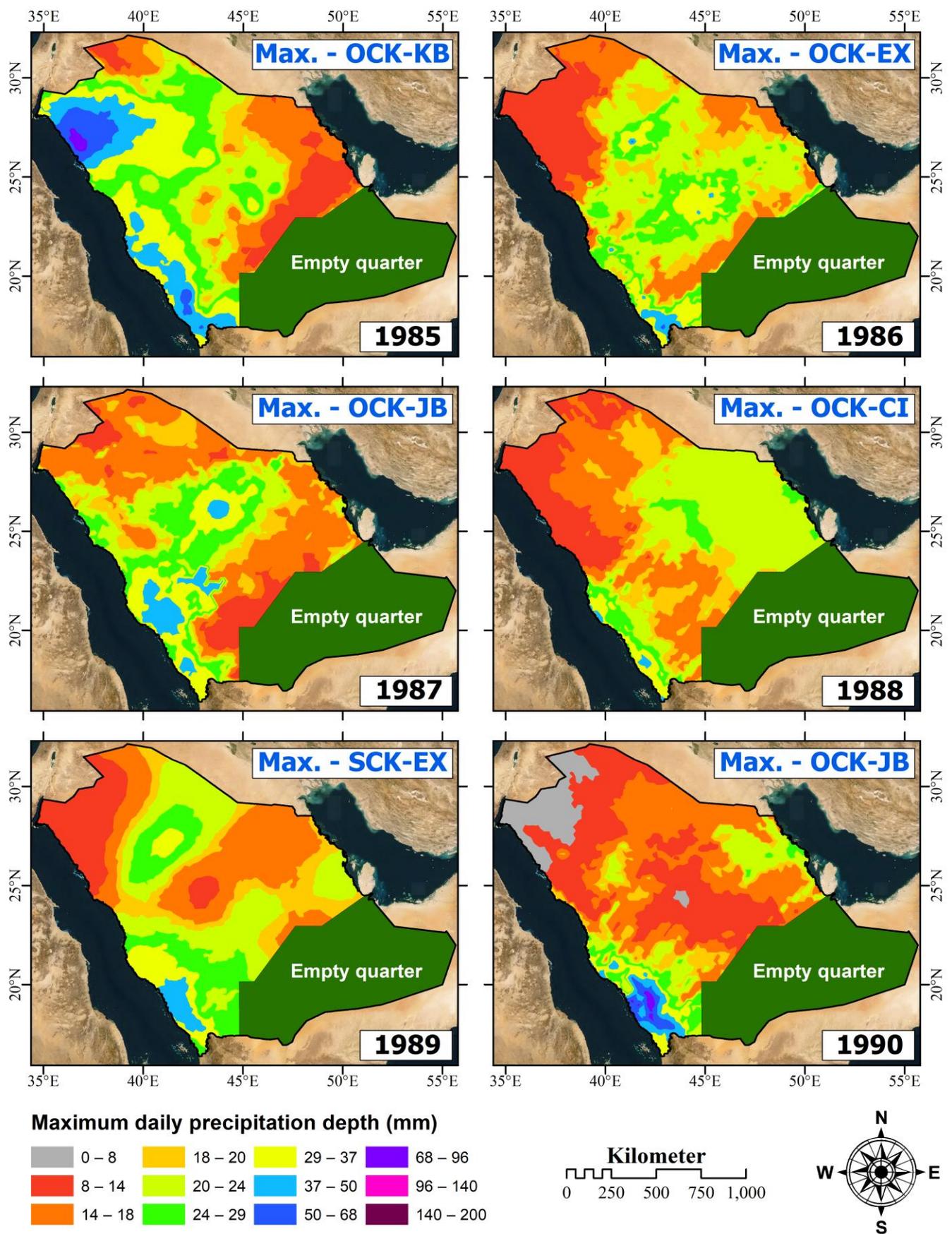
* Correspondence: ahmed.helmi@eng.cu.edu.eg

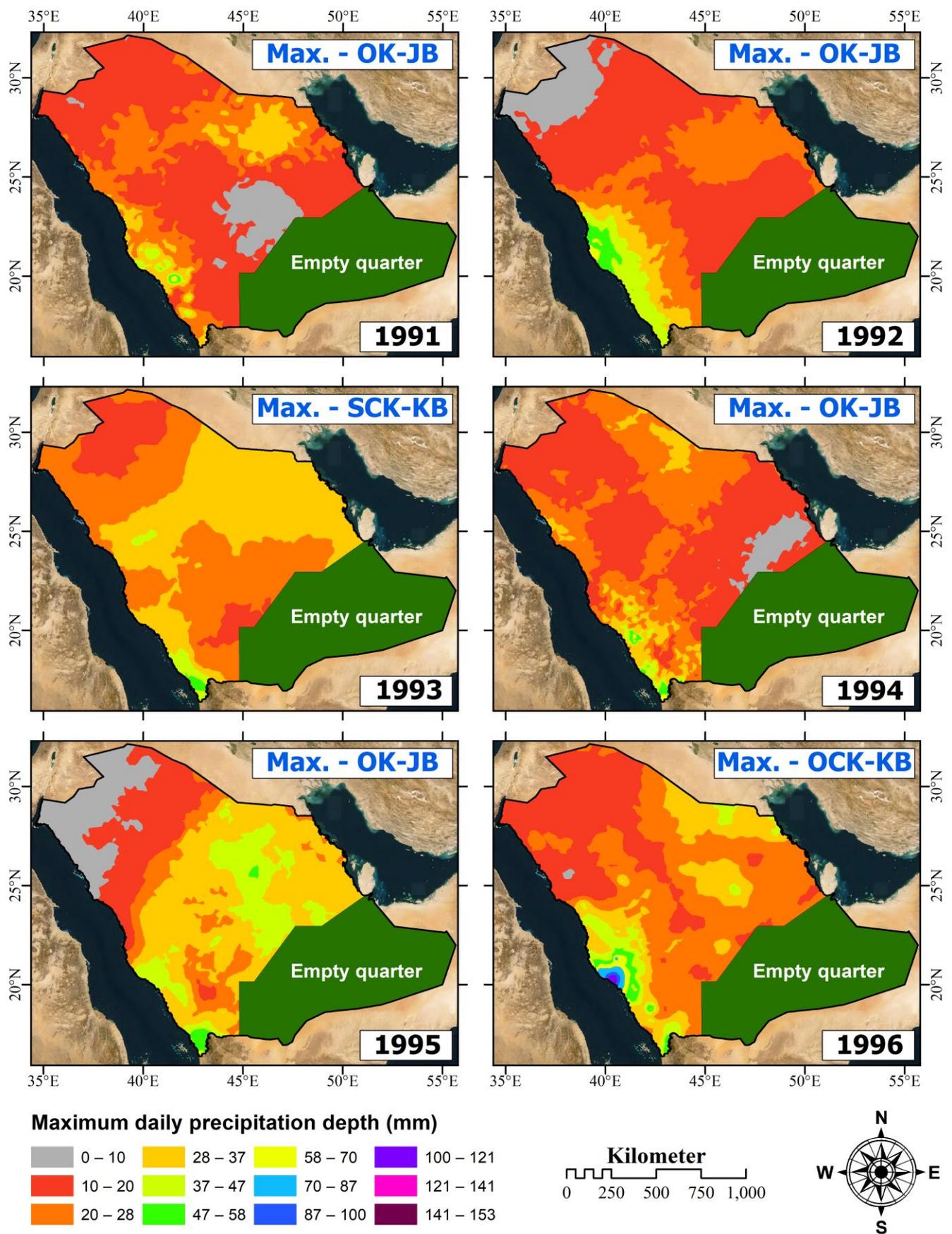
Supplementary Materials

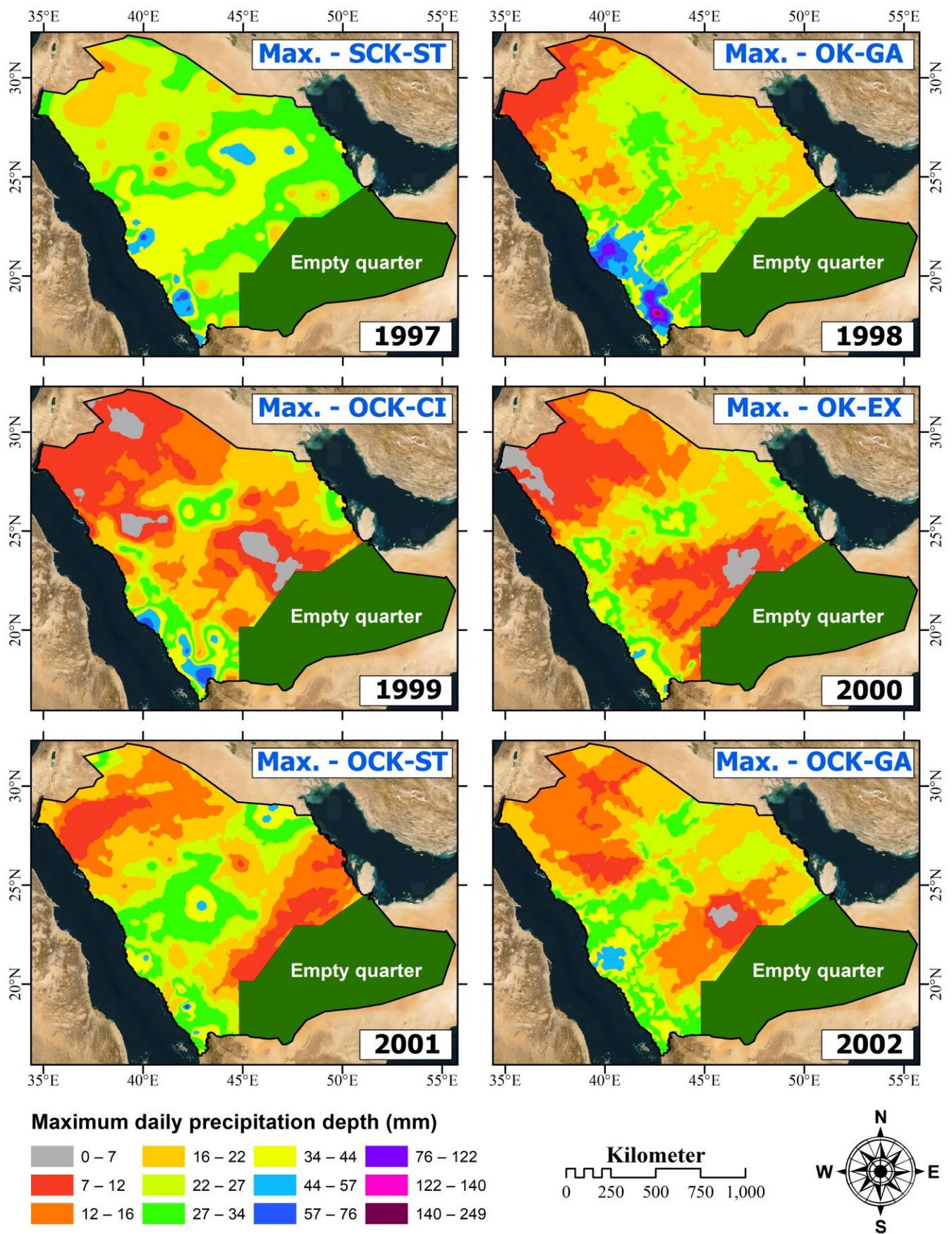


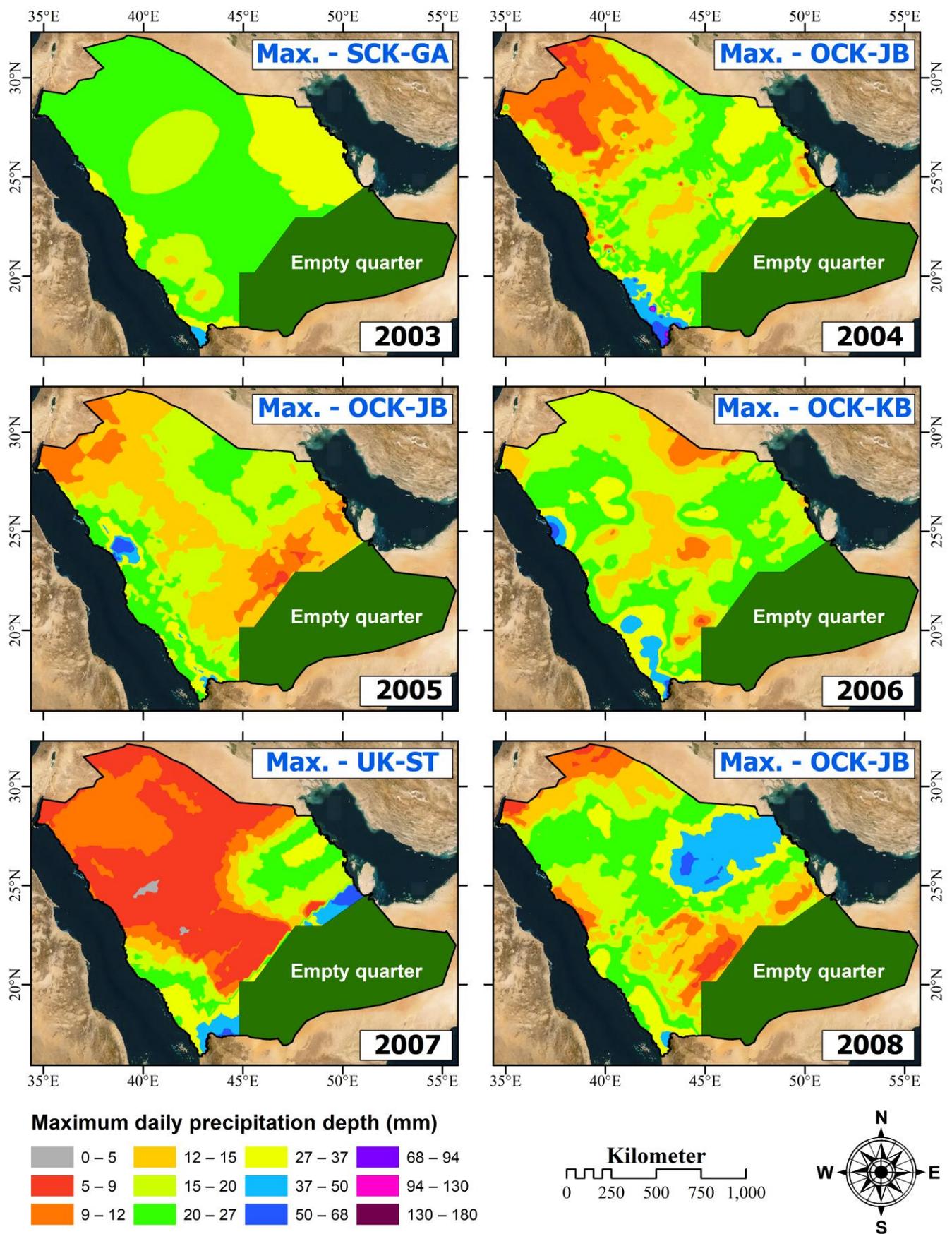


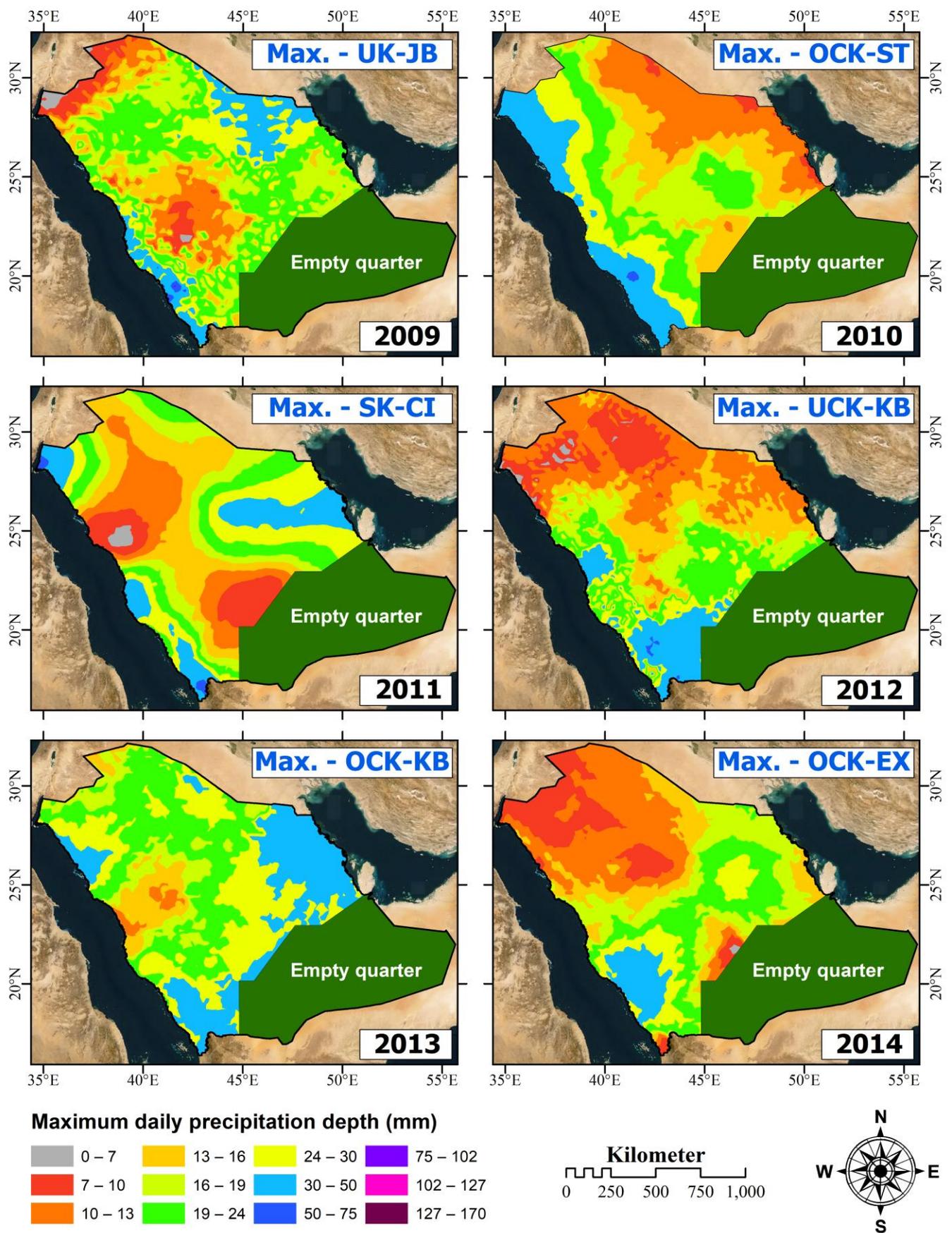












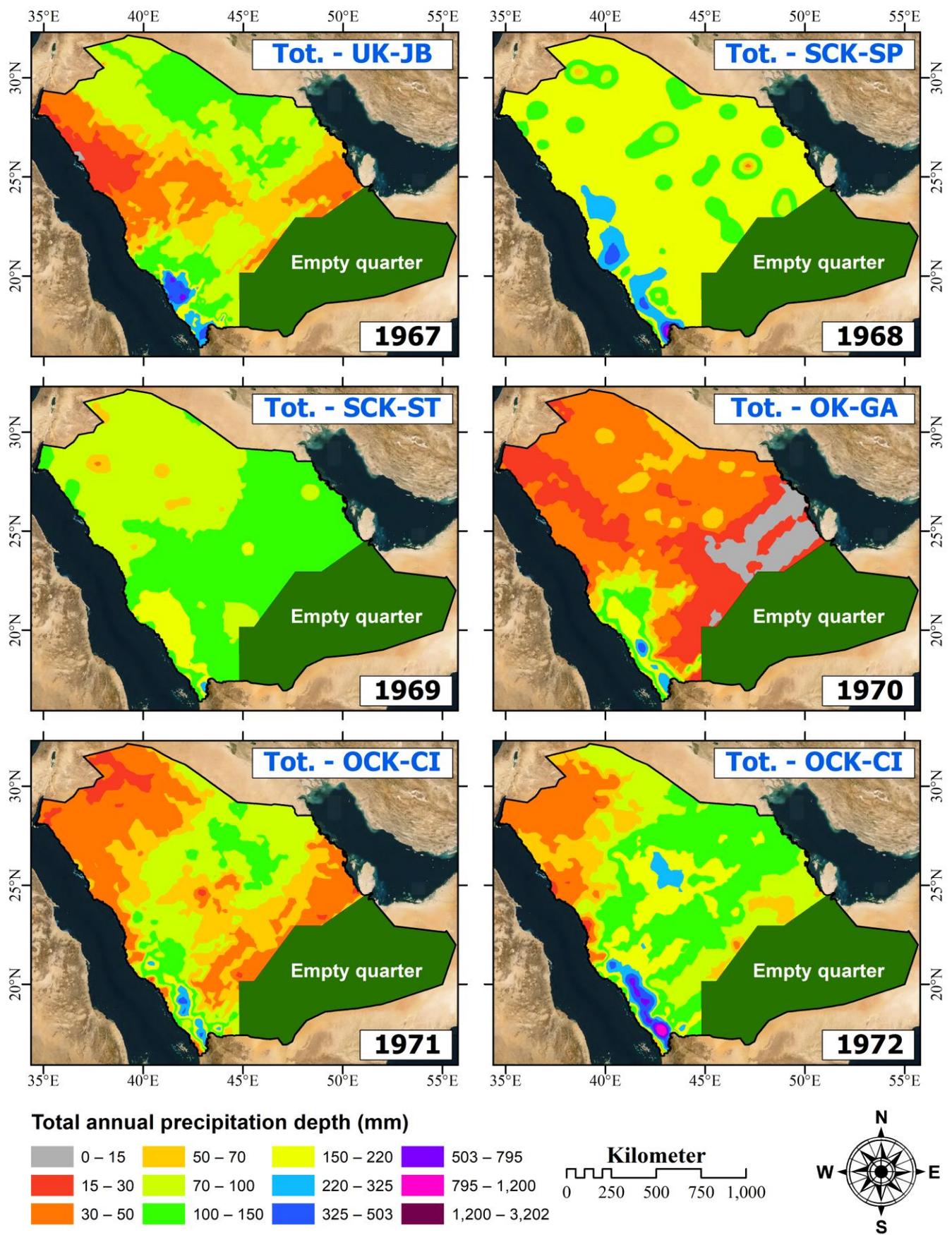
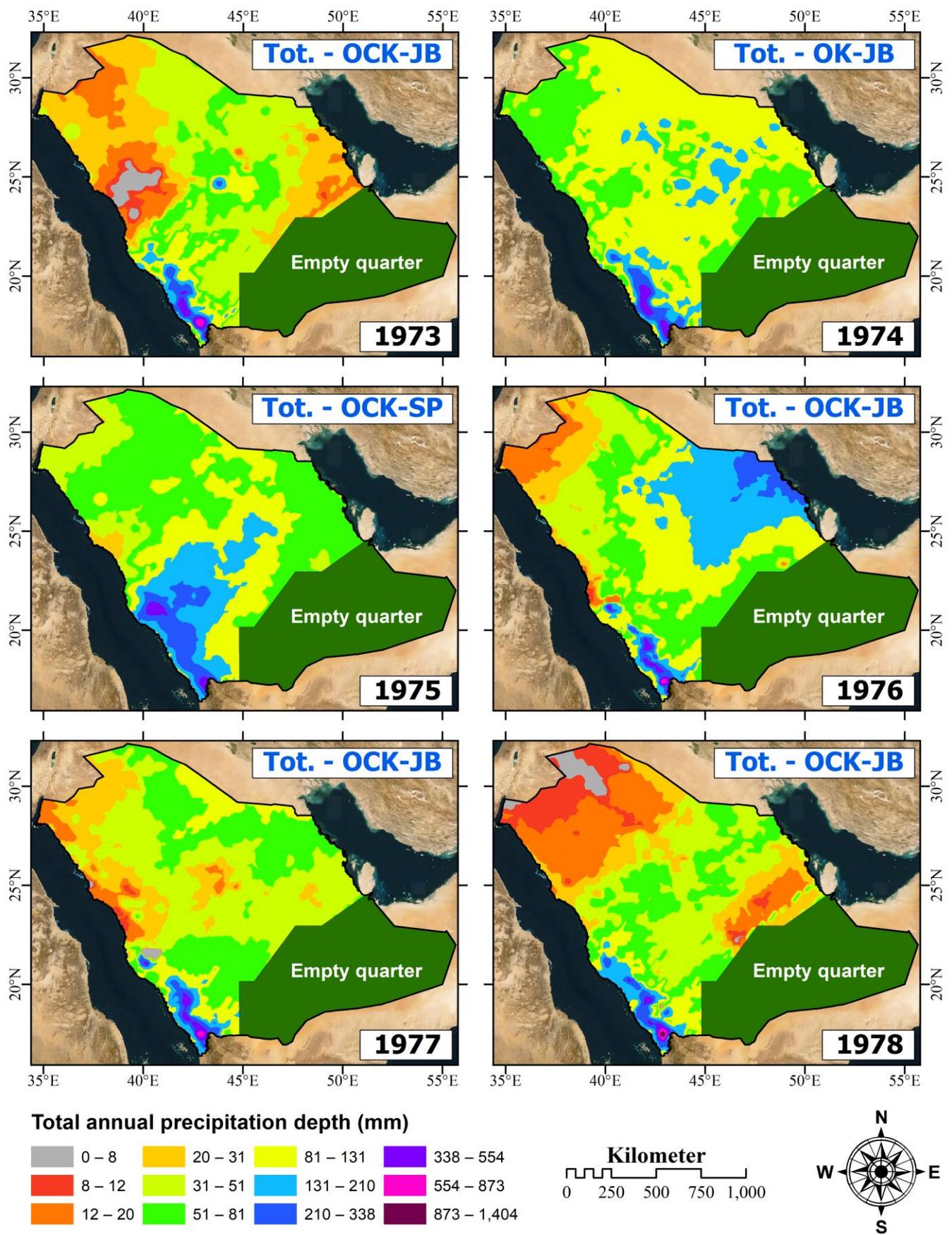


Figure S9. Spatial distribution of total annual precipitation depth from (1967-1972).



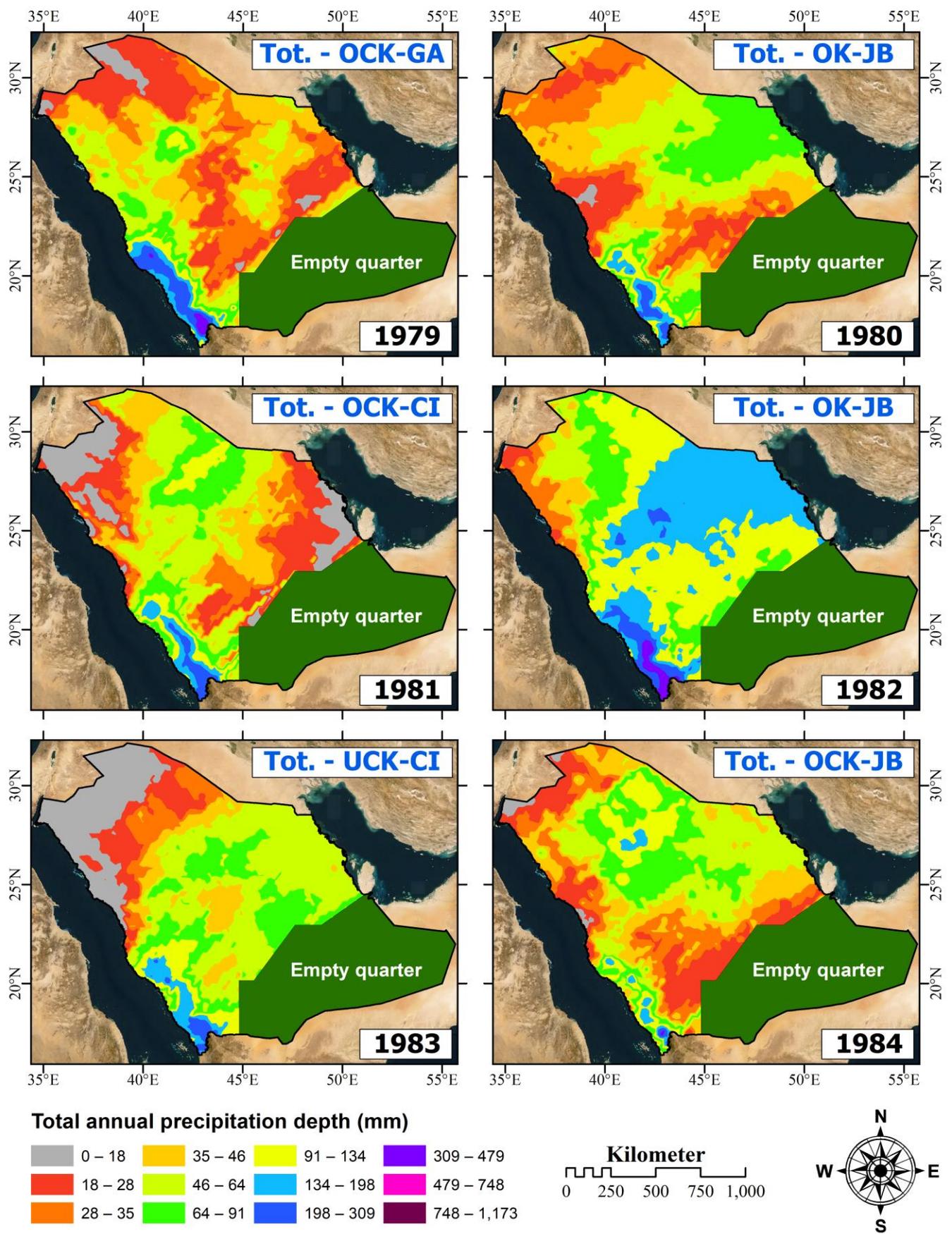
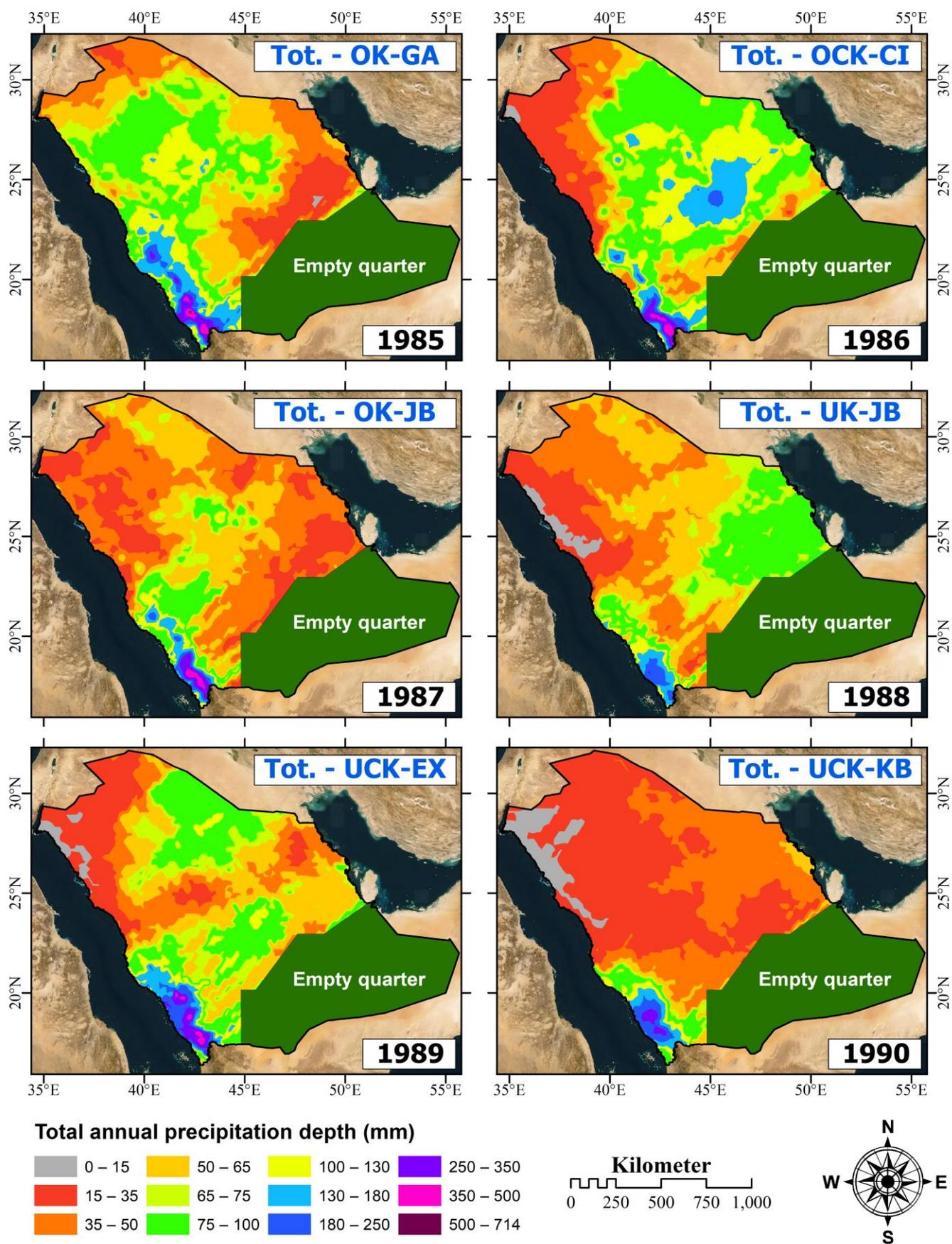
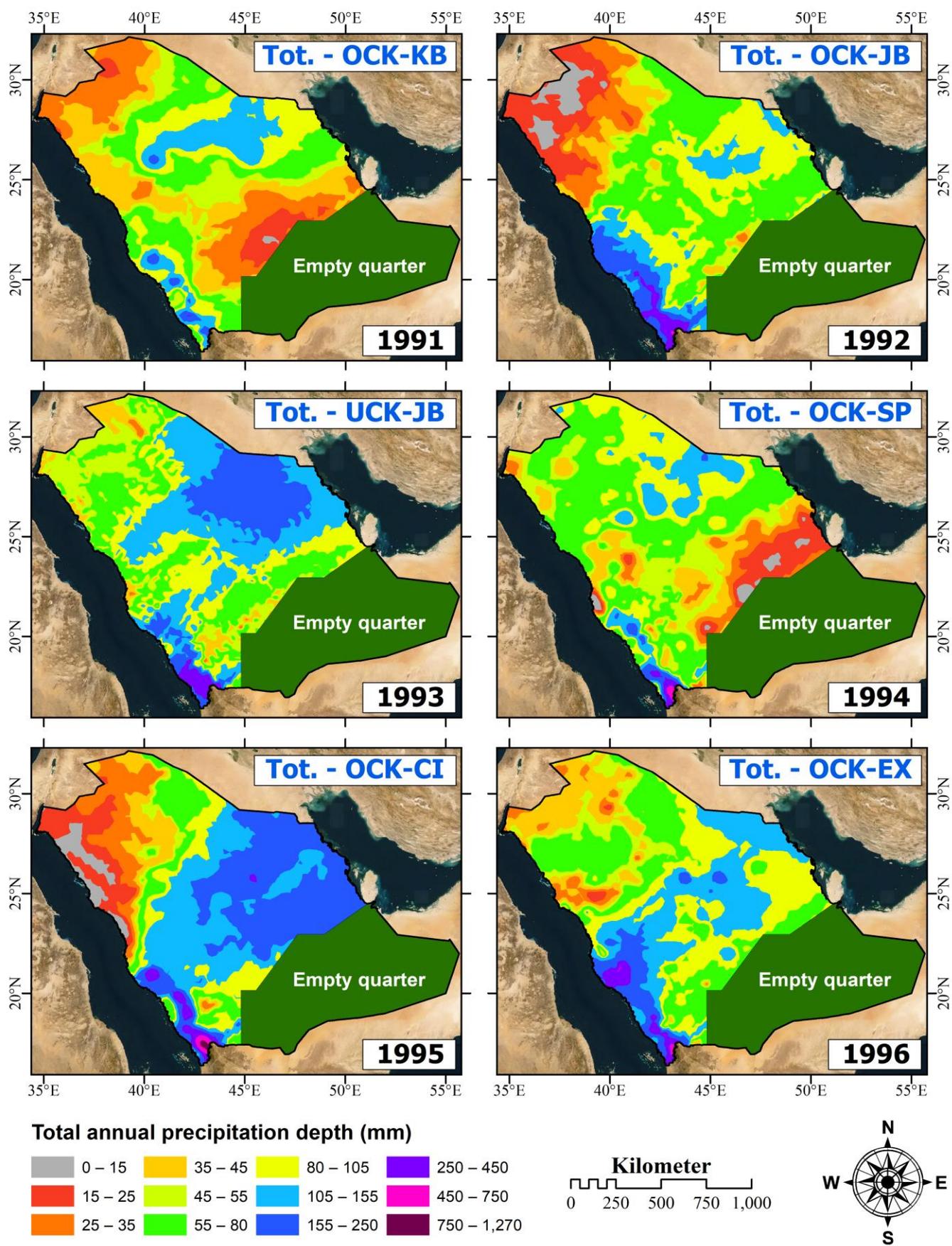
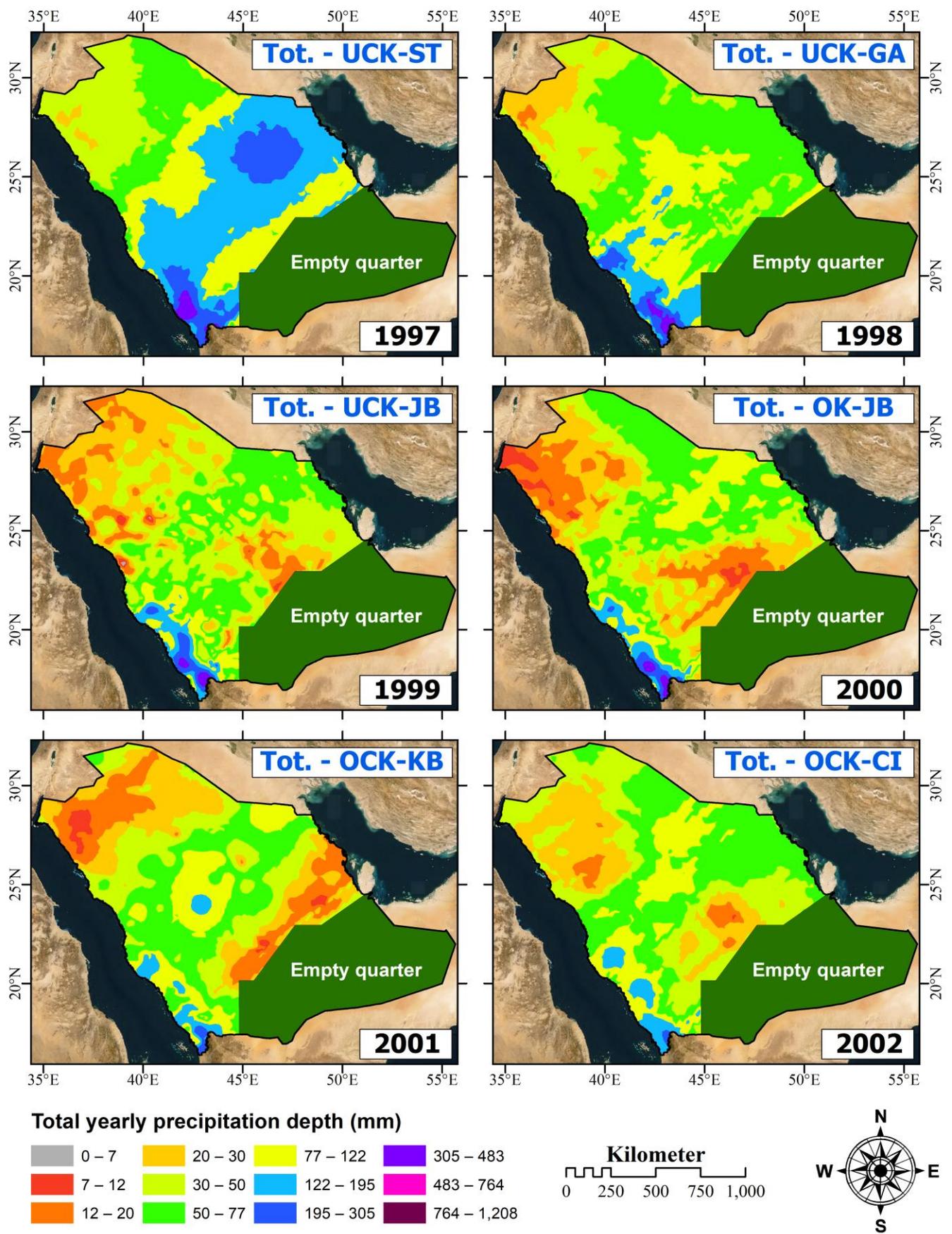


Figure S11. Spatial distribution of total annual precipitation depth from (1979-1984).







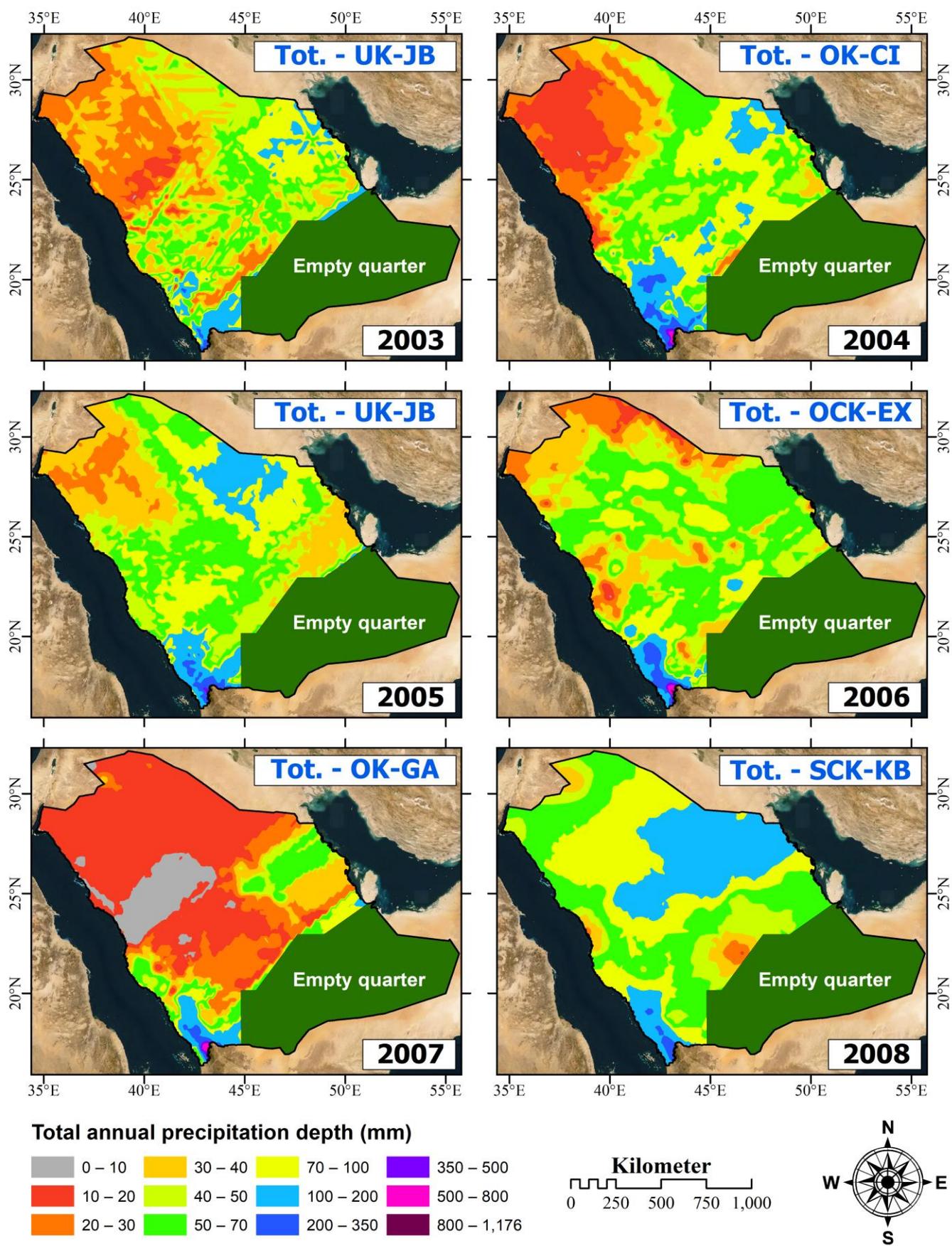


Figure S15. Spatial distribution of total annual precipitation depth from (2003-2008).

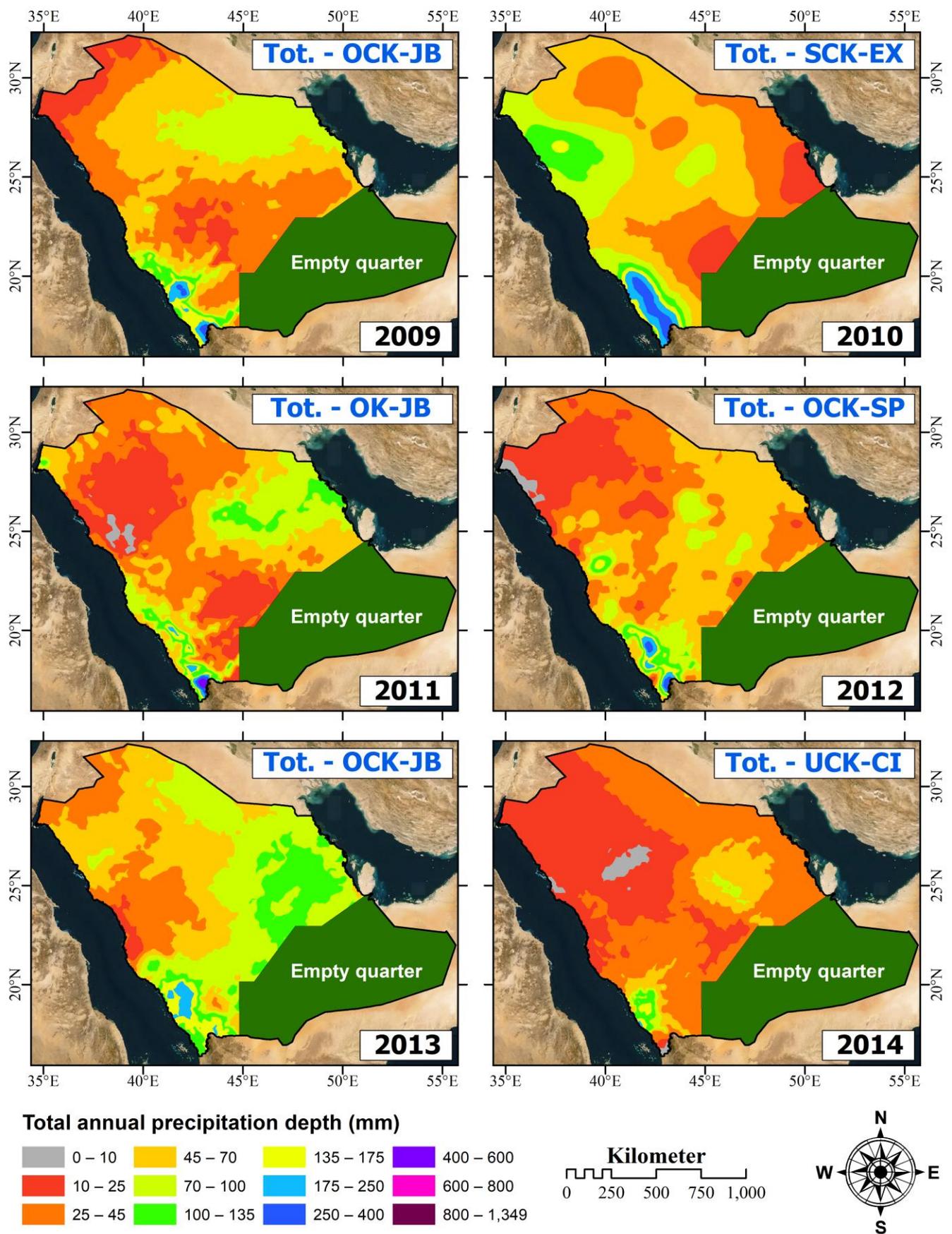


Figure S16. Spatial distribution of total annual precipitation depth from (2009-2014).