The maps in this section show the R-SQUARED between observed and modeled surface temperatures across the MENA region for the four seasons: JJA, DJF, MAM, and SON. R-SQUARED is a statistical measure that indicates how well the model explains the variability in observed data, with values closer to 1 signifying better performance. These maps provide valuable insights into the predictive skill of the climate models, highlighting their ability to capture seasonal temperature patterns.

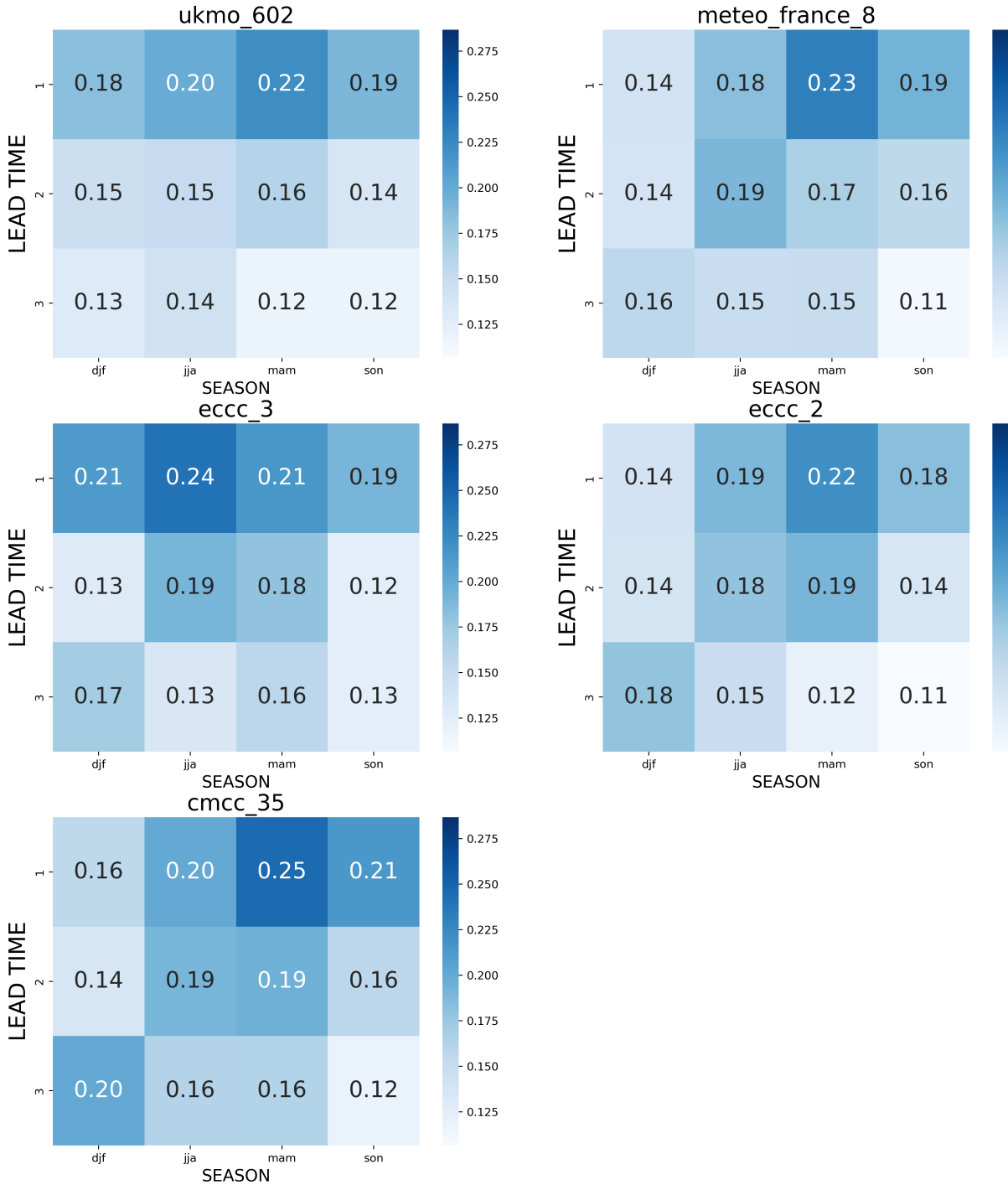

Figure 1: Temperature rsquared heatmaps for all the seasons

Based on this deterministic metric (R-SQUARED), the ECMWF model demonstrates superior performance for lead time 1 across all four seasons, particularly during MAM. In general, the portion of variance explained by the model decreases as the lead time increases. This indicates that while the model is highly effective at capturing seasonal variability of surface temperatures in the short term, its predictive skill diminishes over longer time horizons. The strong performance during MAM highlights the ECMWF ability to capture the complexities of spring, a season marked by transitional weather patterns in the MENA region. The high R-SQUARED values during this period suggest that the model accurately reflects observed temperature variability by effectively simulating key drivers such as the gradual warming trend, atmospheric circulation changes, and the interaction between desert and coastal dynamics. Such precision underscores the ECMWF model's reliability for short-term seasonal forecasting, particularly during periods of heightened climatic variability like MAM. However, the decreasing performance with increasing lead times suggests the need for careful interpretation of forecasts beyond lead time 1, as uncertainty increases with longer projections.

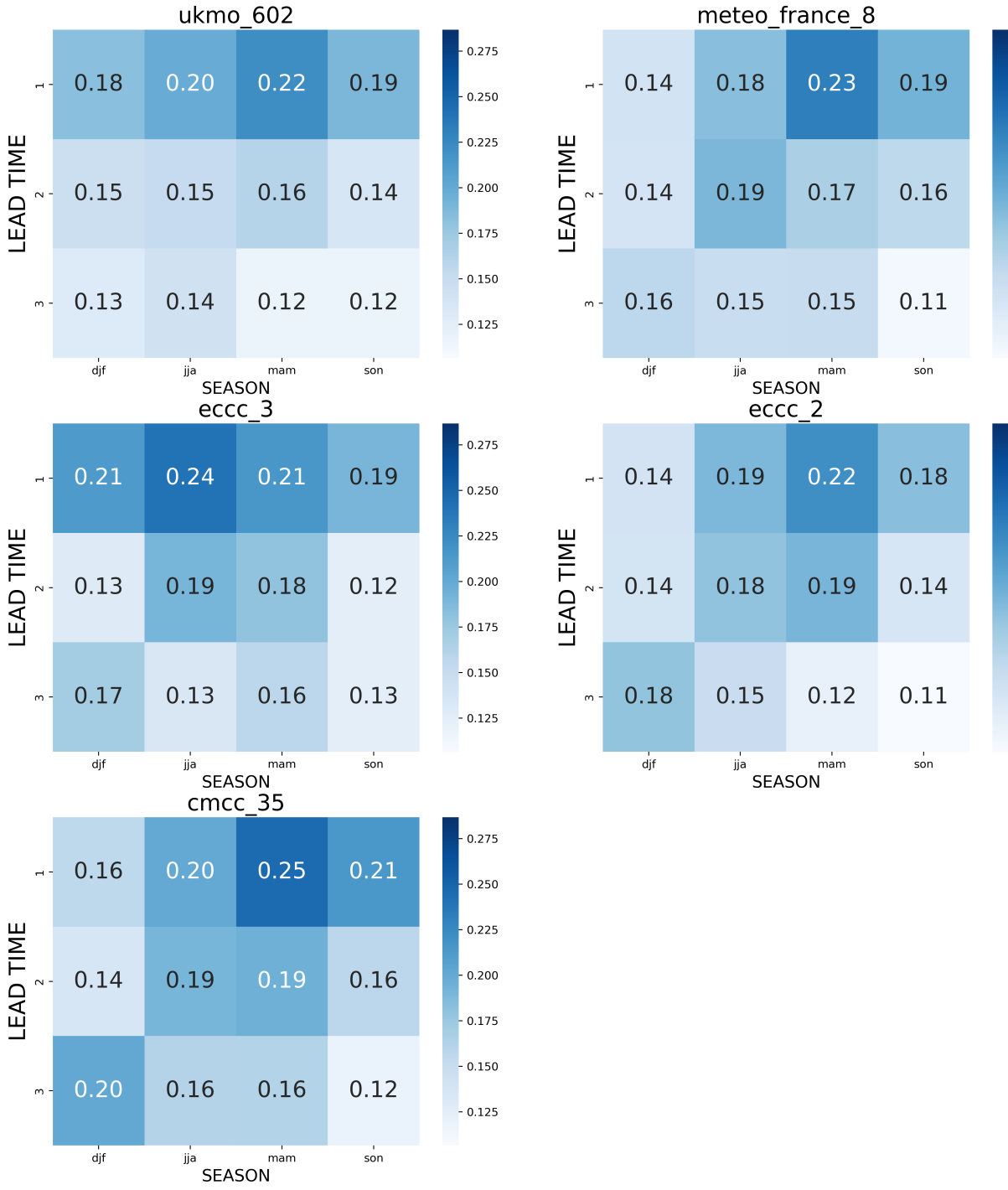

Figure 2: Temperature rsquared heatmaps for all the seasons NA