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Consistency of observed mean sea level pressure trends with climate change projections over the Mediterranean area

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We examine the possibility that anthropogenic forcing (Greenhouse gases and sulphate aerosols, GS) is a plausible explanation for the recently observed mean sea level pressure trends over the Mediterranean area. To this aim observed annual and seasonal trends in mean sea level pressure (SLP) over the time period from 1974 to 2004 are compared with the response to anthropogenic forcing estimated from 23 global coupled atmosphere-ocean general circulation models derived from CMIP3 database and from a set of regional model simulations from CIRCE project. Investigating the consistency of observed trends with climate change projections is an issue of significant societal importance, since it answers an often-asked question in the public, namely the simple question: "Is the trend of recent years a harbinger of the future?" Results indicate that the observed seasonal changes in SLP are very likely not drawn from an undisturbed stationary climate and there is less than an 8% chance that natural (internal) variability is responsible for the observed seasonal mean sea level pressure trends. Obtained results show that the large-scale component (spatial-mean) of the GS signal is detectable (at 5% level) in all seasons except in autumn. However, the small-scale component (spatial anomalies about the spatial mean) of GS signal is detectable only with 8 models in winter (at 8% level) and 15 models in spring (at 5% level). Further, we find that the recent trends are significantly (at 8% level) consistent with all the GS patterns used in this study, except in summer when 3 models and in spring 1 model significantly underestimate the observed SLP trends. Thus, we conclude that GS forcing is a plausible explanation for the observed seasonal SLP trends in the Mediterranean region except in autumn when observation contradicts the projections. These finding are robust to the removal of the signal of the North Atlantic Oscillation.