Title:	Determining the contribution of long-range transport, regional and local source areas, to PM10 mass loading in Hessen, Germany using a novel multi-receptor based statistical approach
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Abstract:	This study uses two newly developed statistical source apportionment models, MuSAM and MuReSAM, to perform quantitative statistical source apportionment of PM10 at multiple receptor sites in South Hessen. MuSAM uses multi-site back trajectory data to quantify the contribution of long-range transport, while MuReSAM uses wind speed and direction as proxy for regional transport and quantifies the contribution of regional source areas. On average, between 7.8 and 9.1 μg/m3 of PM10 (~50%) at receptor sites in South Hessen is contributed by long-range transport. The dominant source regions are Eastern, South Eastern, and Southern Europe. 32% of the PM10 at receptor sites in South Hessen is contributed by regional source areas (2.8–9.41 μg/m3). This fraction varies from <20% at remote sites to >40% for urban stations. Sources located within a 2 km radius around the receptor site are responsible for 7%–20% of the total PM10 mass (0.7–4.4 μg/m3). The perturbation study of the traffic flow due to the closing and reopening of the Schiersteiner Brücke revealed that the contribution of the bridge to PM10 mass loadings at two nearby receptor sites increased by approximately 120% after it reopened and became a bottleneck, although in absolute terms, the increase is small.
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