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# An important fingerprint of wildfires on the European aerosol load

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Wildland fires represent the major source of accumulation mode aerosol (i.e. atmospheric particles with diameters $< 1$ $\mu$m). The largest part of these fires occur in Africa, Asia and South America, but a not negligible fraction also occurs in Eastern Europe and former USSR countries, particularly in the Russian Federation, Ukraine and Kazakhstan. Apart for exceptional cases as the Russian fires of summer 2010, routine agricultural fires in Eastern Europe and Russia have been recently shown to play a crucial role in the composition of the Arctic atmosphere. However, an evaluation of the impact of these fires over Europe is currently not available. The assessment of the relative contribution of fires to the European aerosol burden is hampered by the complex mixing of natural and anthropogenic particle types over the continent. In this study we use long term (2002-2007) satellite-based fires and aerosol data coupled to atmospheric transport modelling to attempt unravelling the wildfires contribution to the European aerosol optical thickness (AOT). Based on this dataset, we provide evidence that fires-related aerosol emissions play a major role in shaping the AOT yearly cycle at the continental scale. In general, the regions most impacted by wildfires emissions and/or transport are Eastern and Central Europe as well as Scandinavia. Conversely, a minor impact is found in Western Europe and Western Mediterranean. We estimate that in spring 5 to 35% of the European fine fraction AOT (FFAOT, i.e. the AOT due to accumulation mode particles) is attributable to wildland fires. The calculated impact maximizes in April (20-35%) in Eastern and Central Europe as well as in Scandinavia and in the Central Mediterranean. An important contribution of wildfires to FFAOT is also found in summer over most of the continent, particularly in August over Eastern Europe (28%) and the Mediterranean regions, from Turkey (34%) to the Western Mediterranean (25%). This unveiled, fires-related, continent-wide haze is expected to play a not negligible role on the European radiation budget, and possibly, on the European air quality, therefore representing a clear target for mitigation.