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# Impacts of air masses origin and trajectory on atmospheric phenomena

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Pollution episodes as well as heavy rain events are often considered as local phenomena because they are often driven by local mechanisms (e.g. , orographic wind forcing, thermal inversions, etc.) . Even if the role of local mechanisms is by far not disputable, nevertheless the origin of air masses as well as the path they followed before to host or origin the local phenomenon can be relevant to explain events onset or intensity.

To study the effect of air masses path on events, a set of "relevant events" occurred over Friuli Venezia Giulia (north east Italy, near to the border between Slovenia and Austria) were chosen to determine the backward trajectories of air masses that host them. The "relevant events" encompassed: i) intense orographic precipitations; ii) high PM10 concentrations; iii) high $O_3$ concentrations; iv) high $SO_2$ concentrations. Backward trajectories were computed using the HYSPLIT model based on numerical simulations (GDAS) run at a resolution of 0.5 deg. "Relevant events" were collected over a period of ten years (2004-2013).

Statistical analysis showed that there are significant differences in the paths followed by air masses before to produce or host "relevant events". In detail: PM10 "events" are produced by air masses that, during the three days before the event move from northwest toward northeast, while $SO_2$ "events" are associated to air masses that moved from northeast toward west. $O_3$ "events", on the contrary, do not have a preferred air mass direction or path, but during their journey, air masses remain tightly connected with lower levels, while for PM10 "events" air masses are subject to a relevant sinking from upper levels toward surface at least three days before event occurrence. This feature seems to suggest that shrinking of air layers is a relevant aspect to achieve large aerosol concentrations at the ground, at least as well as with aerosol emission or formation.

Heavy orographic rain episode deserve a special description. In fact, before their occurrence over Friuli Venezia Giulia, air masses almost always move northward along the Adriatic sea, remaining stick to the surface, then increasing their moisture. This picture seems to suggest that orographic lifting is not enough to produce heavy rain events, but large amounts of moisture are necessary as well.

Results achieved through this work will help operational activities carried out in Friuli Venezia Giulia and can be a useful diagnostic conceptual tool to interpret results, helping forecasters in risk assessments as well as climatologists in potential impacts of climate change over the study area.