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# Anywhere the Wind Blows does Really Matter to Net Ecosystem Carbon Exchange.

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Mistral wind (from North-west direction) affects climate of western Mediterranean basin. Coming from north -east, it crosses France, Sardinia and finally reaches South Italy.
Recent studies showed that climate change is affecting wind speed and directions. In particular, in the case of the Mistral over the Mediterranean area a decrease of the wind speed and changes of the wind direction in the Summer months are predicted using global climate models.
We point out that these climate changes can affect land surface fluxes – evapotranspiration (ET) and carbon exchanges (Fc). Indeed, considering data from an eddy covariance tower in Sardinia (Italy) we show that wind direction and velocity represent larger scale weather conditions affecting land surface fluxes independently of footprint properties in what might be a confounding fashion, requiring extra care in linking footprint properties to flux rates. Hence, we demonstrate that more important can be the large scale (e.g., regional) impact of the wind direction and speed on land surface fluxes.
The island of Sardinia is strongly representative of the Mediterranean region. We consider a representative case study site within the Flumendosa river basin on Sardinia in Orroli, a mixed grass-woodland site on a shallow soil. During 2004 – 2007 a micrometeorological towers with eddy covariance instrumentation monitored land surface fluxes of energy, water, and $CO_2$. In Sardinia Mistral is characterized by the highest wind speed (> 3 m/s). Analyzing meteorological conditions under Mistral over Sardinia we observe a decrease of the air temperature and vapor pressure deficit (VPD). We concentrate on the Summer period during which air temperature and light are not limiting factors of ET and Fc. We distinguish the surprising effect of the mistral on ET and Fc. At the Orroli site the Summer 2005 was characterized by a soil moisture drying due to a small rain event at the end of June followed by an extreme dry period until September. In this period the change of the wind direction to Mistral produces a decrease of VPD, which in turn impacts Fc (which increases). Instead the observed pattern of ET is mainly related to the decrease of canopy conductance (gc) with soil moisture, which impacts ET more than wind direction.
Further concentrating in the driest period - soil moisture less than 0.1 and nearly stable - ET is also nearly stable at 1.15 mm/d, suggesting an hydraulic redistribution from soil in the root zone. Although mean daily ET and soil moisture are relatively invariable during the period, Fc shows a strong variation related to the effect of VPD on gc. In such dry conditions, Fc strongly increases when VPD decreases. Finally from the Summer data we are able to separate the effects of the two main environmental factors (soil moisture and VPD) impacting ET and Fc, and we estimate their relationships.