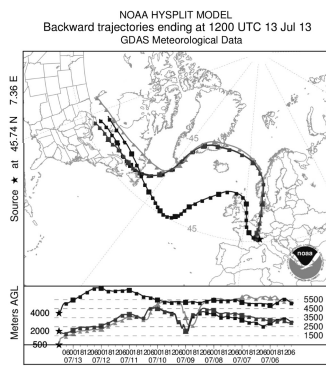


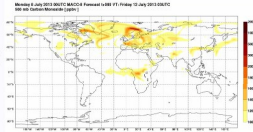
Fotometria e aerosol

Esempi: avvezioni a macroscala



Canadian smoke spreading over Europe

10 July 2013 People in northern Europe wondering about the sometimes slightly hazy skies this month will be surprised to learn that they are looking at smoke from wildfires in Canada. The very active fire season in the Canadian boreal forests is producing large amounts of smoke. While these fires are present every summer, they are currently very widespread and strong winds over the Atlantic are moving the smoke rapidly towards north-western Europe. The weather pattern over Europe, responsible for the nice summer weather, then moves some of this smoke over middle Europe reaching as far south as Italy.



MACC-II routinely monitors emissions of smoke particles (biomass burning aerosol) and other atmospheric pollutants, such as carbon monoxide, using observations from the MODIS satellite instruments. The [GEMS](#) algorithm produces daily global maps of all detectable fires and their emissions, as shown in the figure below. These emission estimates are then fed into MACC-II's global forecasting system for atmospheric composition producing daily 5-day forecasts of the smoke plumes, as shown in the animation. These forecasts are further constrained by merging the information from the model with aerosol and carbon monoxide observations from the MODIS, MOPITT and IASI instruments.



Fotometria e biossido d'azoto

Motivazioni



Troposfera

- effetti sulla salute umana
- piogge acide (HNO_3)
- radiative forcing
(assorbimento a 400–500 nm)

Stratosfera

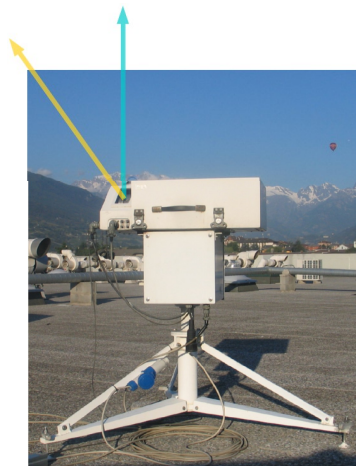
- catalizzatore dei processi di distruzione dell'ozono stratosferico (25÷40 km, Crutzen)
- moderatore della distruzione dell'ozono (10÷25 km): conversione di forme attive in specie reservoir



Fotometria e biossido d'azoto

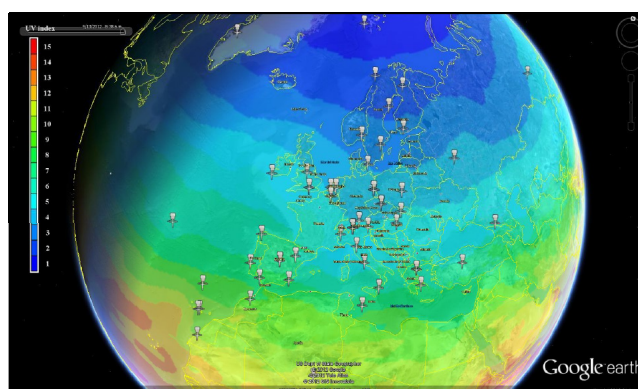
Lo spettrofotometro Brewer

- 1970 – oggi
- O₃ e SO₂
- NO₂
 - ▶ algoritmo aggiornato da ARPA
- radiazione UV
- spessore ottico dell'aerosol



Fotometria e biossido d'azoto

La rete mondiale



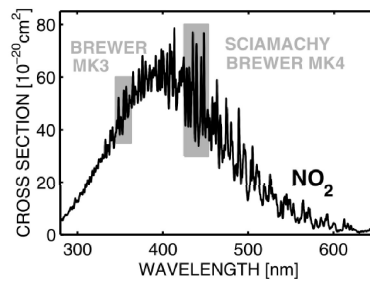
200 stazioni Brewer
40 nazioni
60 MKIV Brewers



Fotometria e biossido d'azoto

L'algoritmo

$$\begin{aligned} \log I_i &= \log I_{0i} \\ &- \mu_R \beta_{Ri} \\ &- \mu_{NO_2} X_{NO_2} \alpha_{NO_2i} \\ &- \mu_{O_3} X_{O_3} \alpha_{O_3i} \\ &- \mu_A \delta_{Ai} \\ &- const \end{aligned}$$



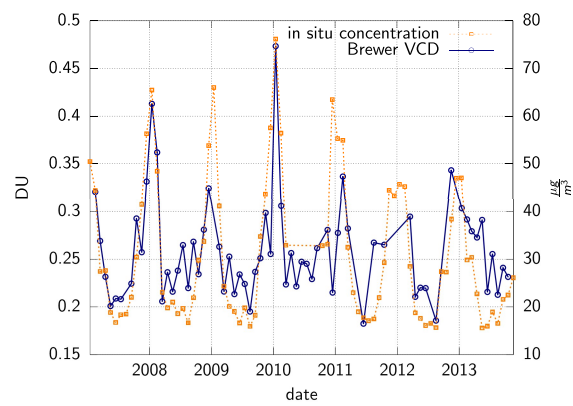
$$\lambda_i = 431 - 453 \text{ nm}$$

6 lunghezze d'onda → possiamo separare i fattori in base alla loro diversa "firma" spettrale



Fotometria e biossido d'azoto

Correlazione con le misure in situ



Aosta, Brewer #066 (medie mensili)

Confronto Brewer – in-situ: correlazione di Spearman $r_s = 0.7$

