Copernicus Atmosphere Monitoring Service

Technical User Guide

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Abstract

The abstract.

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1. Introduction

Some of today's most important environmental concerns relate to the composition of the atmosphere. The increasing concentration of the greenhouse gases and the cooling effect of aerosol are prominent drivers of a changing climate, but the extent of their impact is often still uncertain.

At the Earth's surface, aerosols, ozone and other reactive gases such as nitrogen dioxide determine the quality of the air around us, affecting human health and life expectancy, the health of ecosystems and the fabric of the built environment. Ozone distributions in the stratosphere influence the amount of ultraviolet radiation reaching the surface. Dust, sand, smoke and volcanic aerosols affect the safe operation of transport systems and the availability of power from solar generation, the formation of clouds and rainfall, and the remote sensing by satellite of land, ocean and atmosphere.

To address these environmental concerns there is a need for data and processed information. The Copernicus Atmosphere Monitoring Service (CAMS) has been developed to meet these needs, aiming at supporting policymakers, business and citizens with enhanced atmospheric environmental information.

The Copernicus Atmosphere Monitoring Service (CAMS, atmosphere.copernicus.eu/) is establishing the core global and regional atmospheric environmental service delivered as a component of Europe's Copernicus programme.

2. Study Area, Data & Materials

{Introduction}

2.1. Pollutants

2.1.1. Surface Ozone (O_3)

Ozone (O_3) in the troposphere (the lowermost part of the atmosphere, from the surface to 6-15 km height depending on the latitude) is highly relevant for the Earth's climate, ecosystems, and human health. Tropospheric ozone is the third largest contributor to greenhouse radiative forcing after carbon dioxide and methane (Forster et al., 2007). It is part of the Earth's shield against ultraviolet radiation, particularly when there is stratospheric ozone depletion (Sabziparvar et al., 1998).

Ozone plays a crucial role in tropospheric chemistry as the main precursor for the OH radical which determines the oxidation capacity of the troposphere (Seinfeld and Pandis, 2006). It is a toxic air pollutant affecting human health (Bell et al., 2006) and agriculture (Royal Society 2008). Furthermore, through plant damage, it impedes the uptake of carbon into the biosphere (Sitch et al., 2007).

Accurate long-term measurements of ozone in the troposphere, including near the earth surface in unpolluted and polluted environments, are needed in order to assess the impacts of tropospheric ozone on the earth system, human health and ecosystems, and to detect changes in the atmospheric composition which could aggravate or reduce these impacts because of changing ozone precursor emissions or climate change.

2.1.2. NO_x: Nitric Oxide (NO) + Nitrogen Dioxide (NO_2)

NO_x is a generic term for the mono-nitrogen oxides (Mollenhauer and Tschöke, 2010; Omidvarborna et al., 2015), nitric oxide (NO) and nitrogen dioxide (NO_2). They are produced from the reaction among nitrogen, oxygen and even hydrocarbons (during combustion), especially at high temperatures (Omidvarborna et al., 2015; Annamalai, 2007).

Item	**Forecast**	**Analysis**
Description	Forecast at surface, 50m, 250m, 500m, 1000m, 2000m, 3000m, 5000m above ground	Analysis at the surface
Available for users at	6:00 UTC	09:45 UTC for the day before
Species	O3, NO, NO_2	O3, NO, NO_2
Timespan	0-96h, hourly	0-24h for the day before, hourly

Table 1. Products of CHIMERE model

2.2. Study Areas

2.2.1. Global

2.2.2. European-scale

The regional forecasting service provides daily 4-day forecasts of the main air quality species and analyses of the day before, from 7 state-of-the-art atmospheric chemistry models and from the median ensemble calculated from the 7 model forecasts. The regional service also provides posteriori reanalyses using the latest validated observation dataset available for assimilation.

2.3. Available Files

2.4. Data Access Methods

3. Models

3.1. Global

3.2. European-scale

3.2.1. CHIMERE

3.2.2. EMEP

3.2.3. EURAD-IM

3.2.4. LOTOS-EUROS

3.2.5. MATCH

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4. Examples

5. Conclusions

References

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