Update of the COST726 Total Ozone Data Base up to December 31, 2008

Janusz W. Krzyścin
Institute of Geophysics Polish Academy of Sciences

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TOTAL OZONE MEASUREMENTS
GROUND-BASED SPECTROPHOTOMETERS

DOBSON (AROSA - 1926), BREWER (GRECE-1982), FILTER INSTRUMENT (M83/M124, RUSSIA ~ 1970)

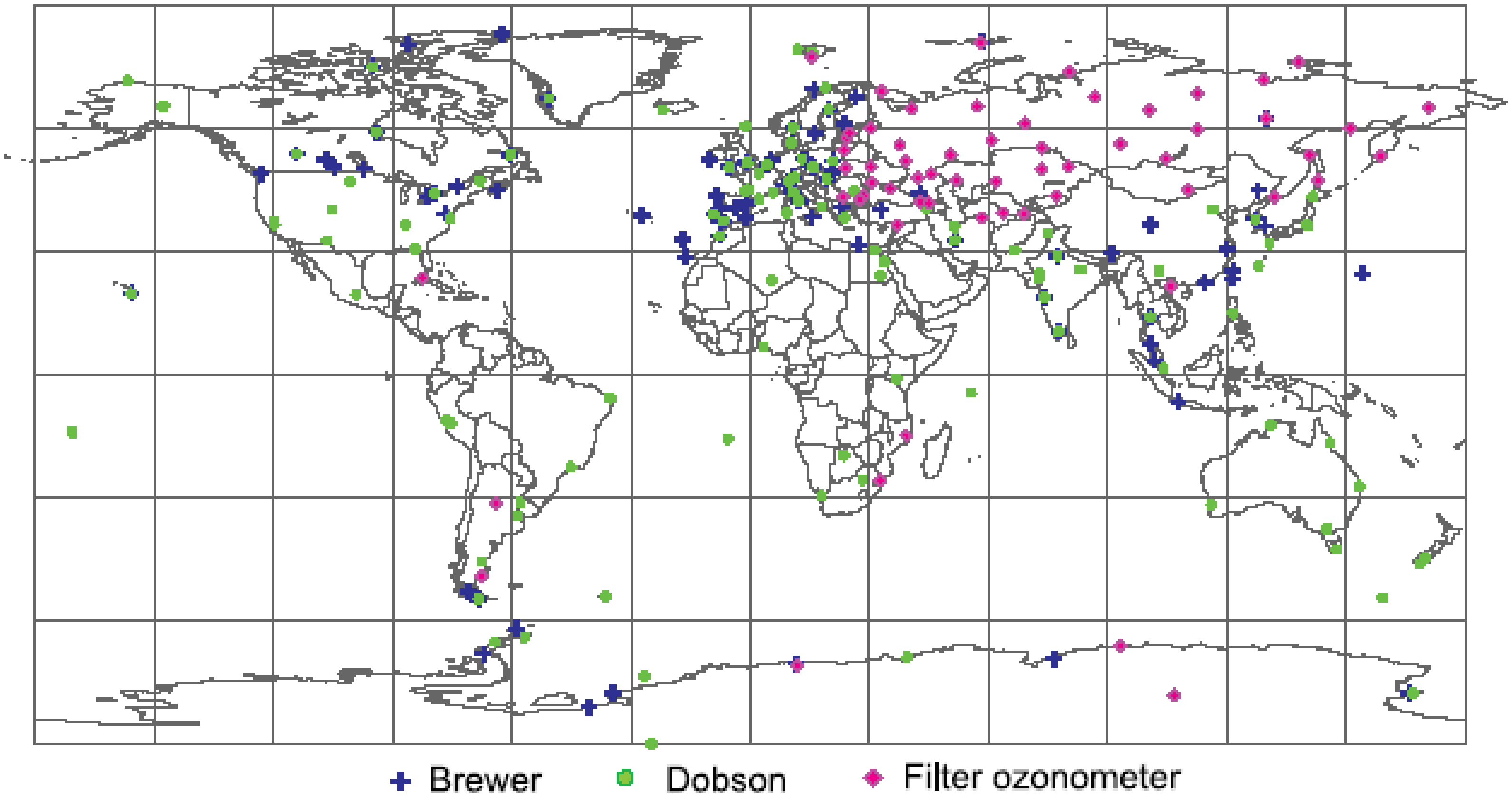
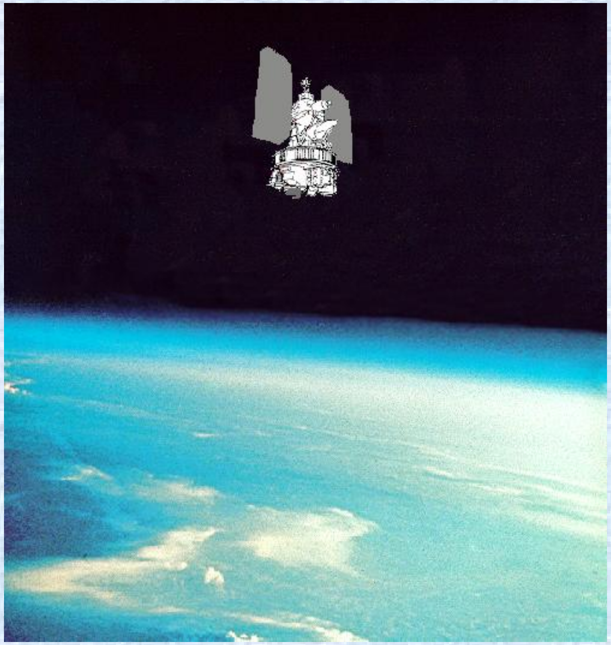


Figure 1. Map showing the location of total ozone stations where data were submitted to the WOUDC within the period of 1979–2006. The WOUDC data contained within this temporal range represents a total of 103 agencies, located in 78 countries, reporting data.

(source: Fioletov et al. (2008),JGR)

TOTAL OZONE MEASUREMENTS
SATELLITE- BORNE SPECTROPHOTOMETERS



Nimbus 7 Platform

TOMS : (since October 1978)

NIMBUS 7 - 1978-1993

METEOR 3 – 1991-1994

Earth Probe – 1996-2005

SBUV : (operational monitoring since 1985)

NOAA-9, 11, 14, and 16

TOVS: (operational monitoring 1995-2005)

NOAA satellite

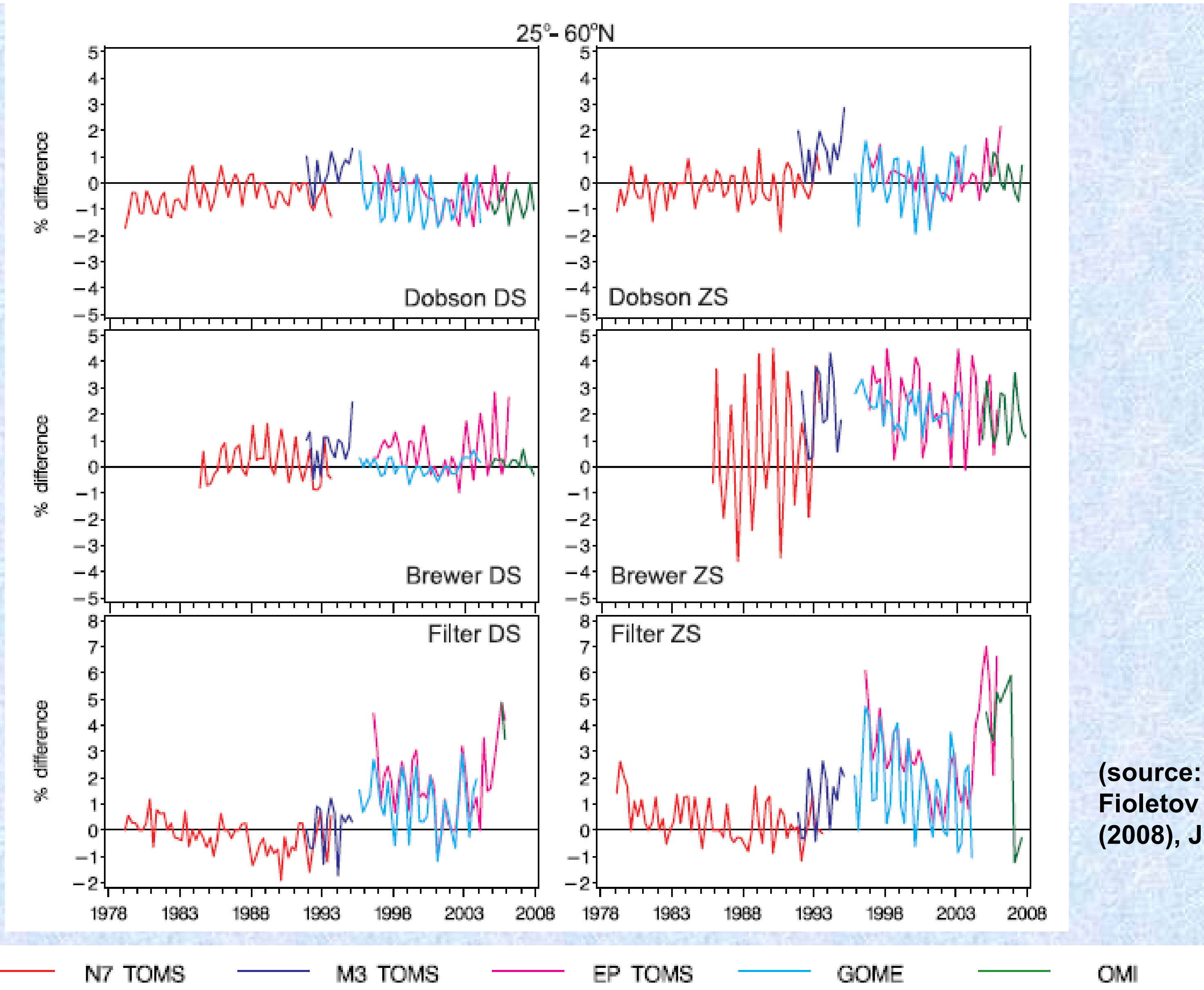
GOME: (1995 - present) – ERS-2 platform

SCIAMACHY: (2002 - present) – ENVISAT platform

OMI: (2004 – present) -AURA platform

Signs of the instrument degradation since 2008

COMPARISON:
GROUND-BASED MINUS SATELLITE TOTAL OZONE



(source: Fioletov et al. (2008), JGR)

SELECTED TOTAL OZONE DATA BASES

NIWA - GLOBAL TOTAL OZONE DATA 1978-2004:

National Institute of Water and Atmosphere Research (NIWA), Lauder, New Zealand, Assimilated Total Ozone Data Base 1979-2004 (Bodeker et al., 2005)

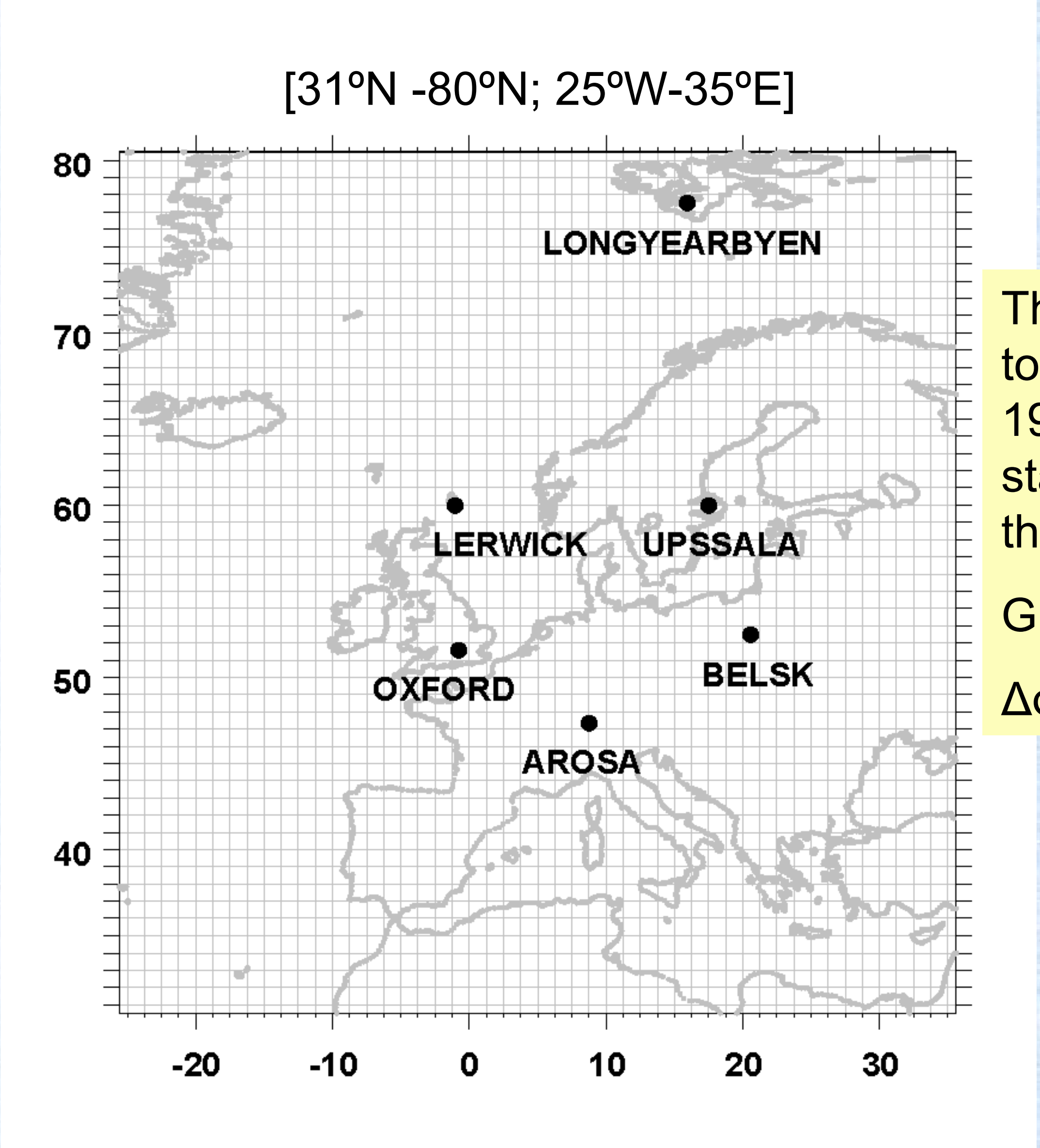
- Version 8 Nimbus 7 and Earth Probe TOMS
- GOME version 3.1
- KNMI TOGOMI
- Version 8 SBUV from NIMBUS 7, NOAA9, NOAA 11, and NOAA 16

ERA-40 (1958-2002)- GLOBAL DATA
TOOL: 3-D GCM SIMULATIONS

COST-726 : (1950-2004) EUROPE DATA
TOOL: STATISTCAL MODEL TRAINED ON NIWA DATA 1979-2004

IN BSCW COST726 SERVER :
COST726 MODEL DATA 1950-2004: NIWA DATA 1979-2004

COST-726 DATA BASE



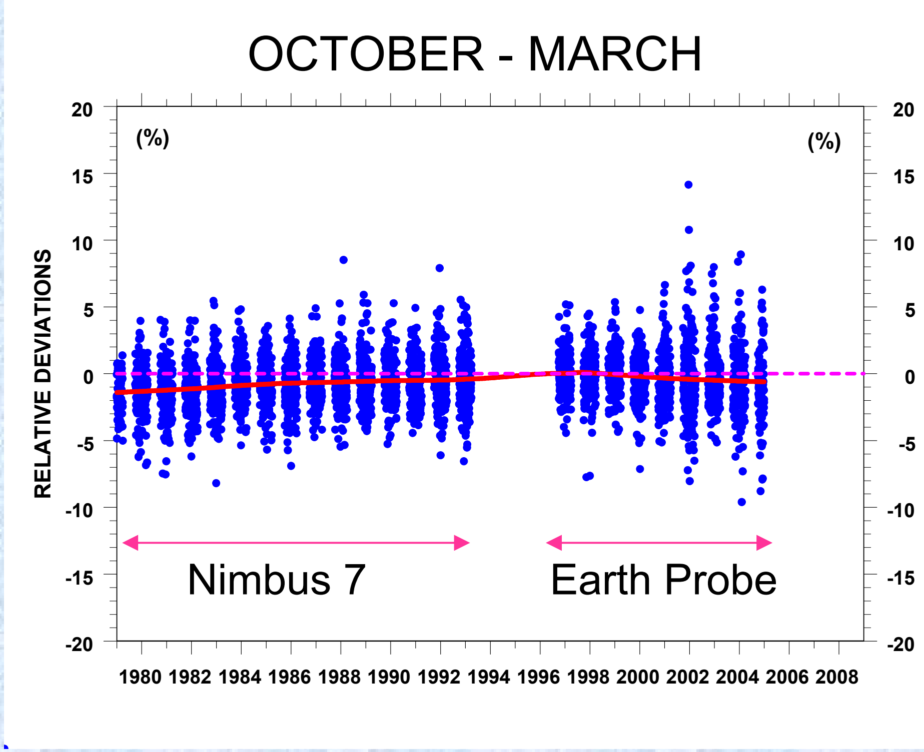
The area with reconstructed daily total ozone values for the period 1950-2004 and ground-based stations used for the validation of the model.

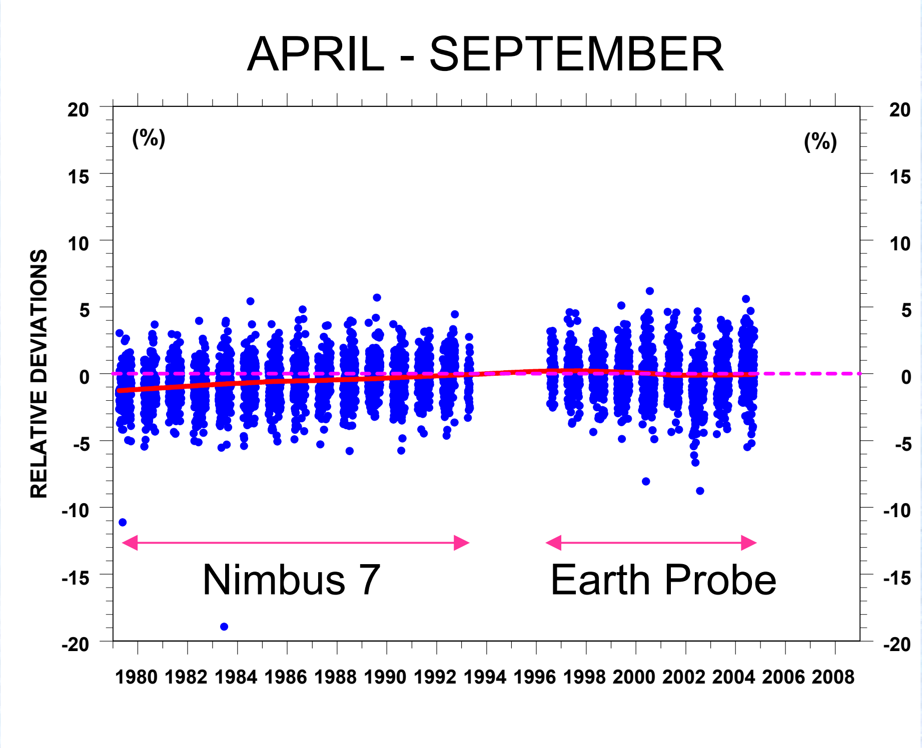
Grid resolution:

$\Delta\varphi=1°$, $\Delta\lambda=1°$ (BSCW)

Daily Total Ozone over DeBilt: 1979-2004

(COST 726– SATELITTE)/ SATELITTE *100%





MEAN RELATIVE DEV.= -0.54% ± 2.02%

MEAN RELATIVE DEV.= -0.38% ± 1.66%

BASIC CHARACTERISTICS COST726 O_3 DATA BASE

* LONG-TERM BIAS BETWEEN COST726 AND GROUND-BASED O_3 WITHIN ±2%

* RELATIVE DIFFERENCES BETWEEN DAILY O3 IN PRE-SATELLITE ERA *t <1979* (COST MODEL VALIDATION PERIOD)

BIAS	±1% (MAY-SEPTEMBER)	±2% (OCTOBER-APRIL)
STANDARD DEVIATION	5% (MAY-SEPTEMBER)	8% (OCTOBER-APRIL)

* BSCW (COST726 SERVER) DATA CONTAINS:

  RECONSTRUCTED (1950-2004) COST726 O3

  NIWA O3 (1979-2004)

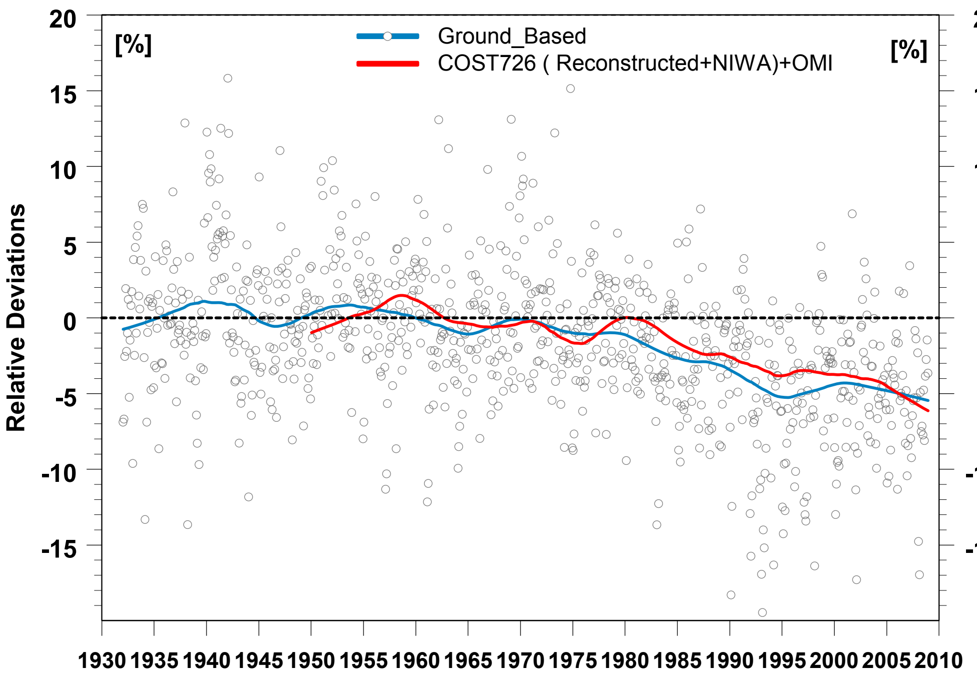
  OMI TOTAL OZONE DATA (2005-2008) will be ATTACHED SOON

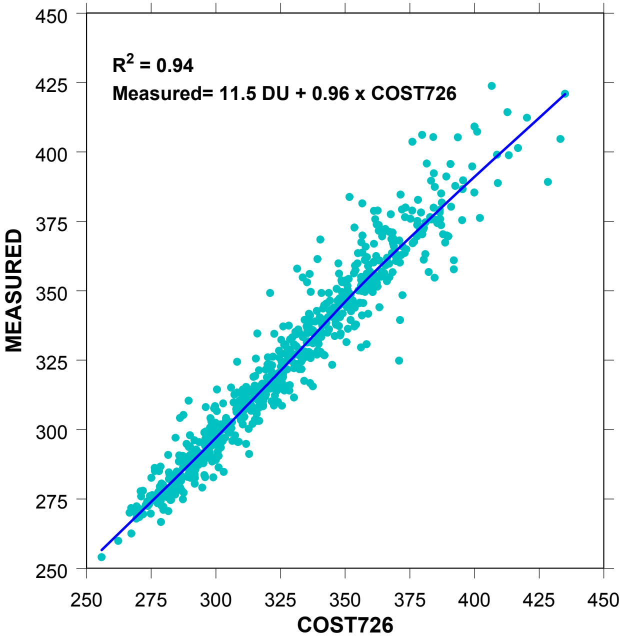
  PROGRAM TO EXTRACT DAILY O3 (1950-2008):

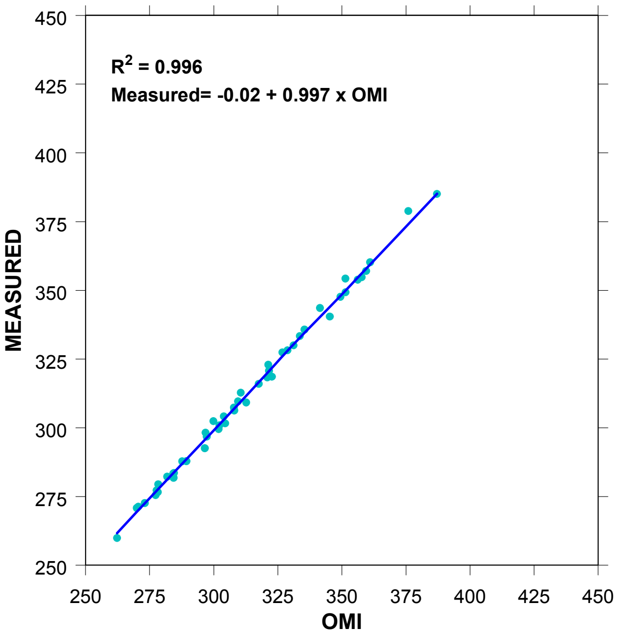
  USER SELECTS: φ AND λ

  OUTPUT: COST726 O3 BEFORE 1979 AND NIWA O3 AFTERWARDS

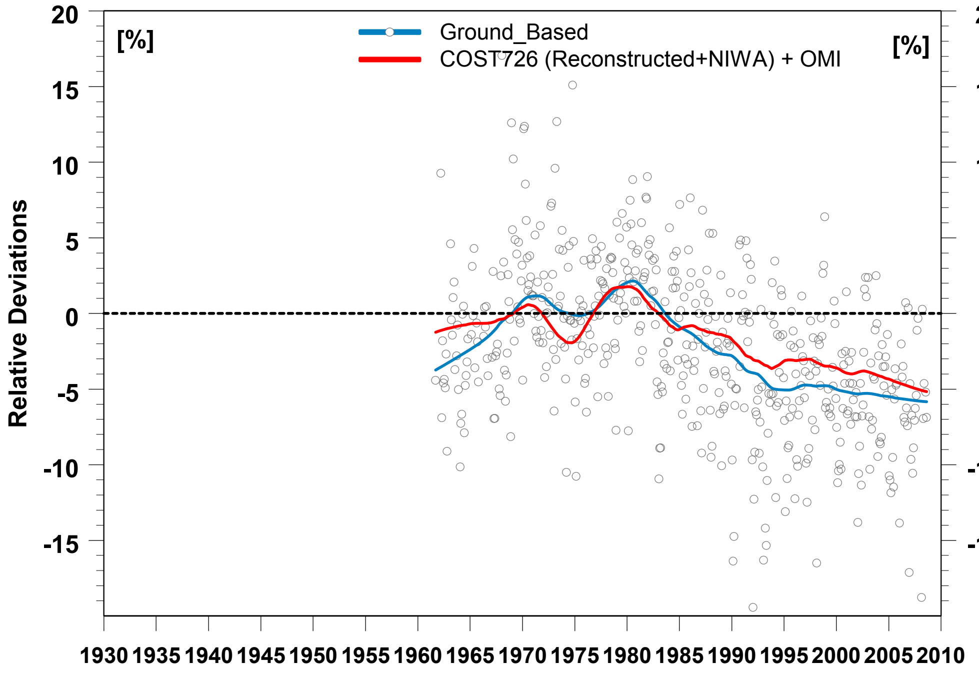
AROSA 1932-2008

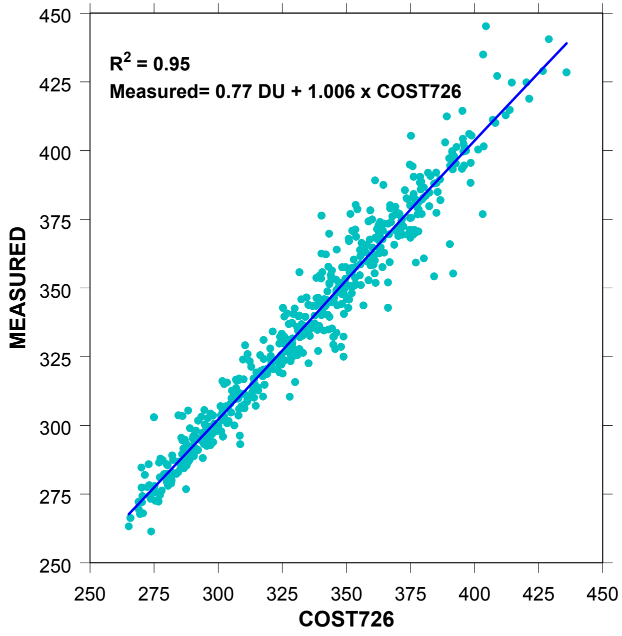


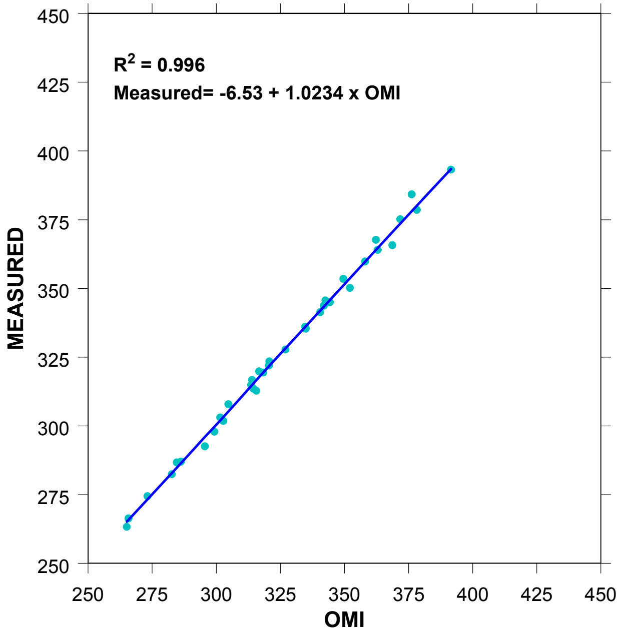




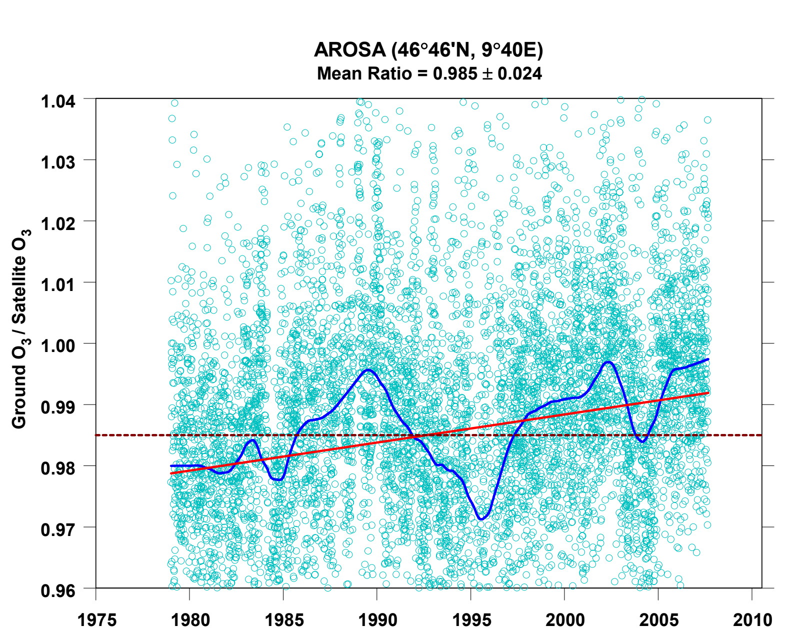
HRADEC KRALOVE 1961-2008

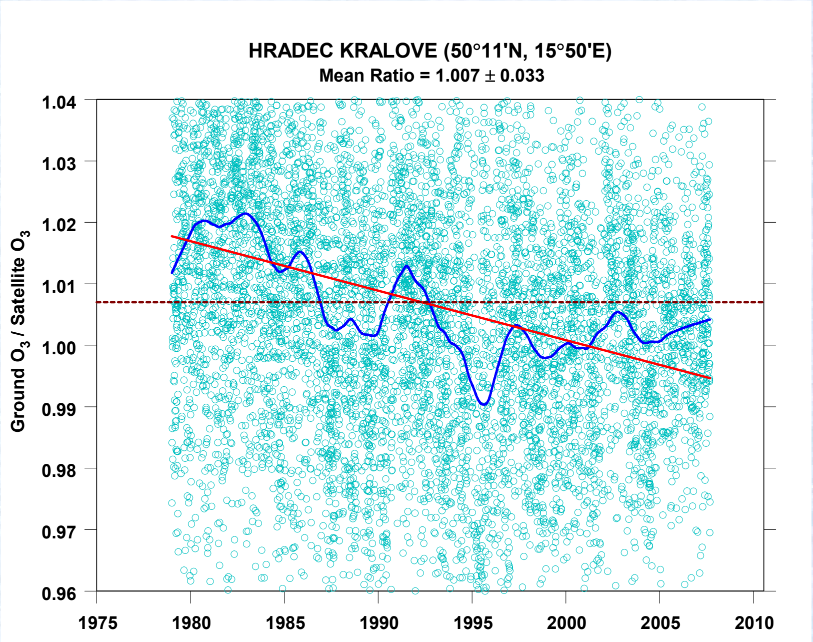


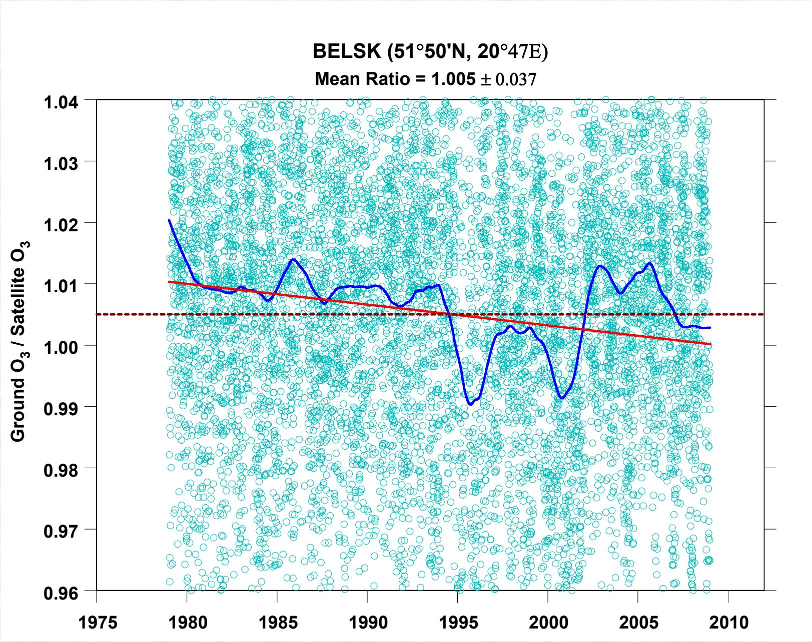


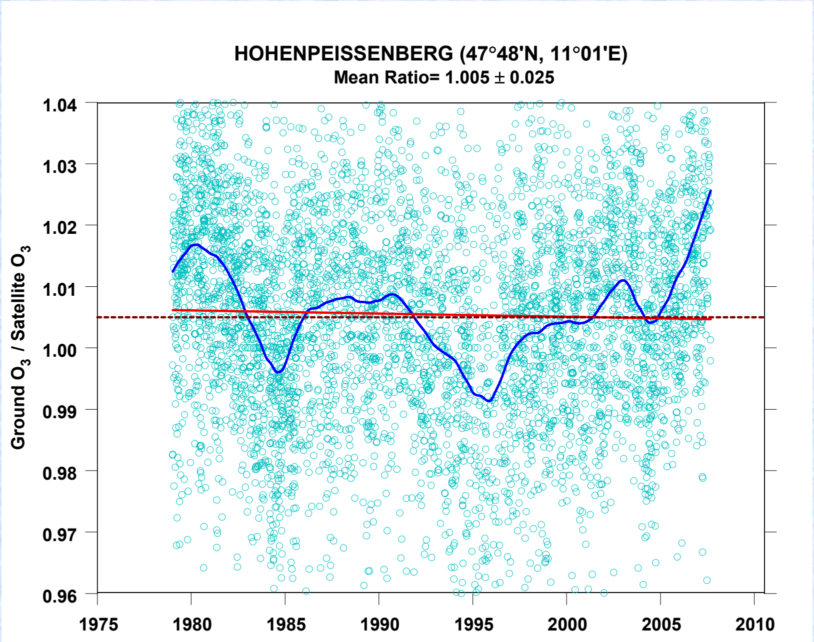


Daily O_3 Ratio: GROUND/ NIWA (1979-2004) + GROUND/OMI (2005-2008)

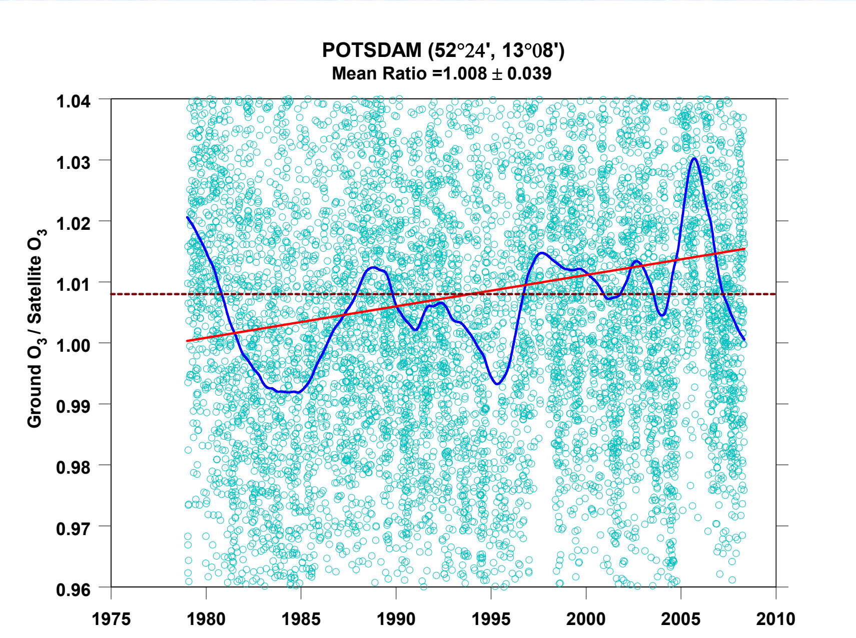


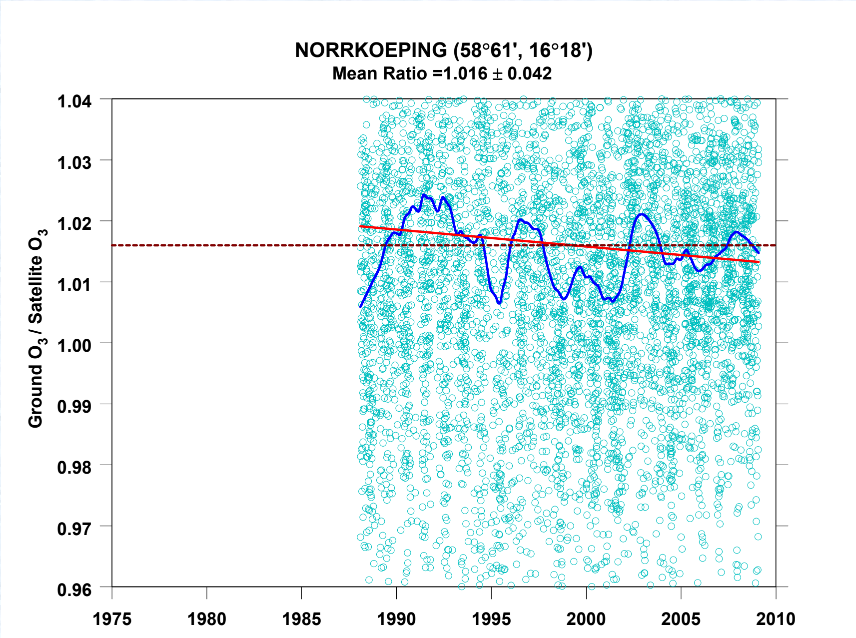


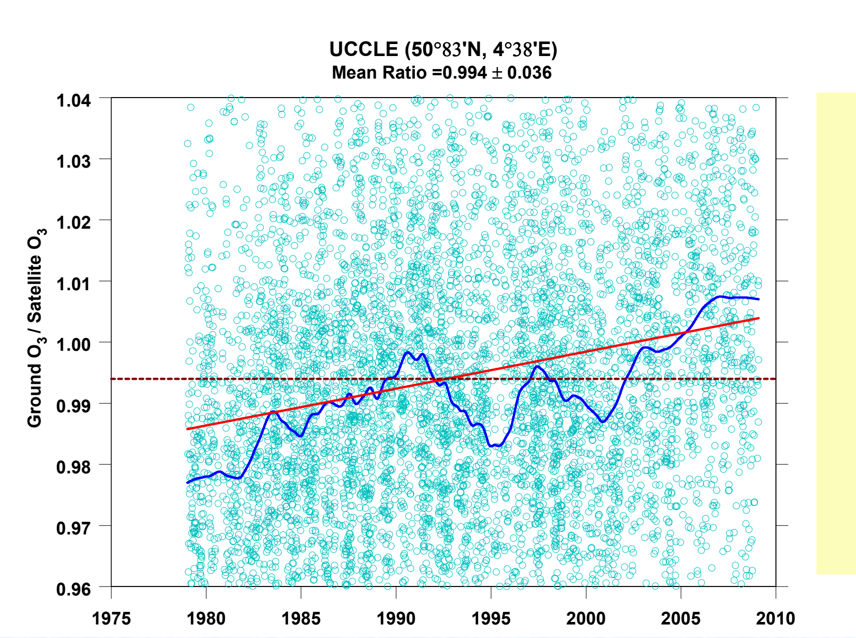




GROUND/ NIWA (1979-2004) OR GROUND/OMI (2005-2008)







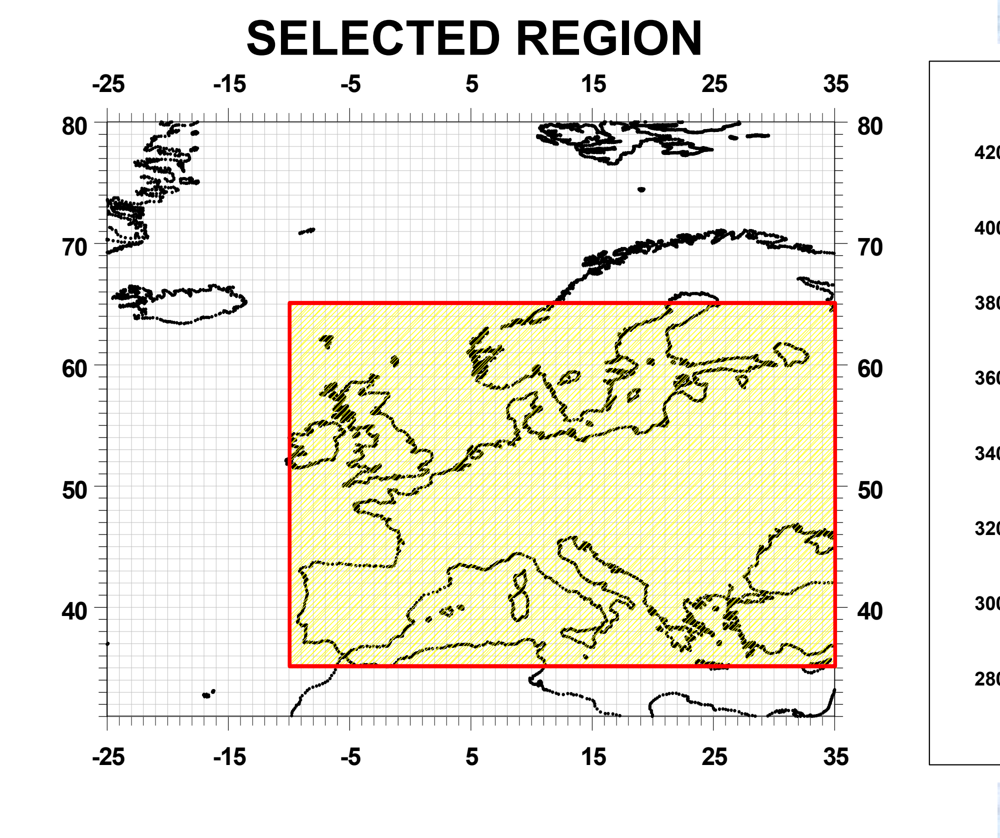
LOCAL DIFFERENCES IN THE LONG-TERM PATTERN OF THE RATIO SHOW UNCERTAINTY LEVEL OF GROUND-BASED NETWORK < ± 2% in 1979-2008

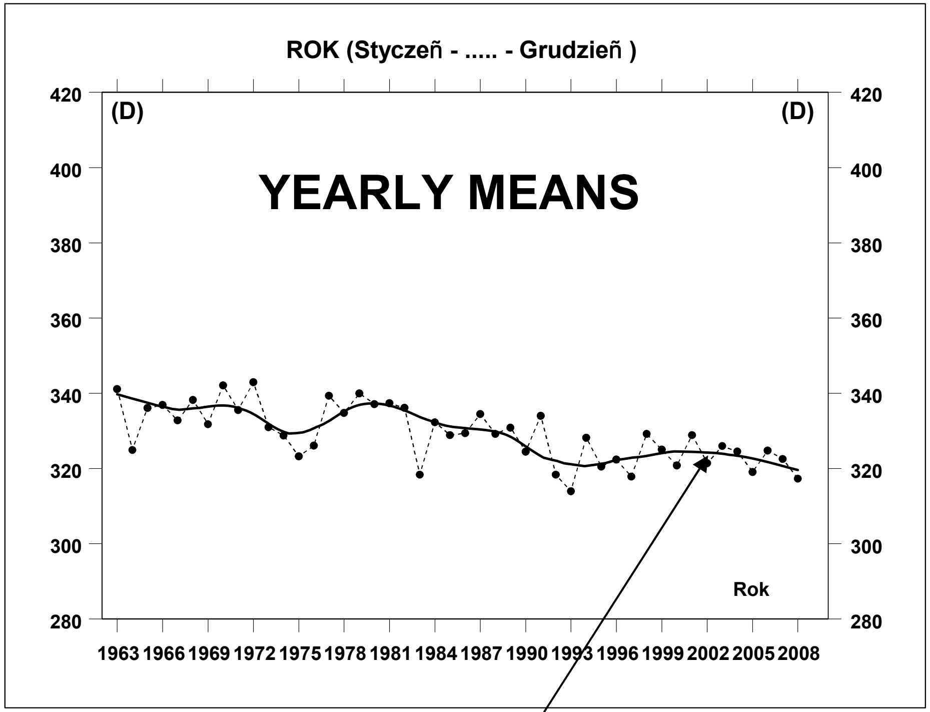
TREND IN THE RATIO < ±0.7%/10YR

OZONE CHANGE OF ~1% IN THE PERIOD 1995-2008 MAY BE DUE TO INSTRUMENT CHANGES

COST726 + OMI DATA

AVERAGED OVER THE EUROPEAN MIDLATITUDES: 1963-2008



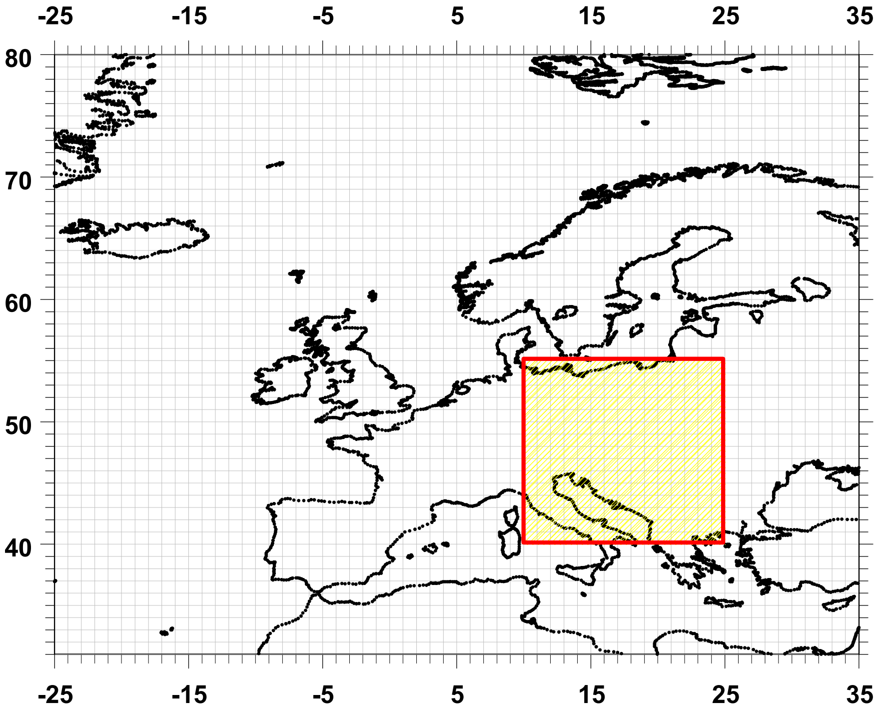


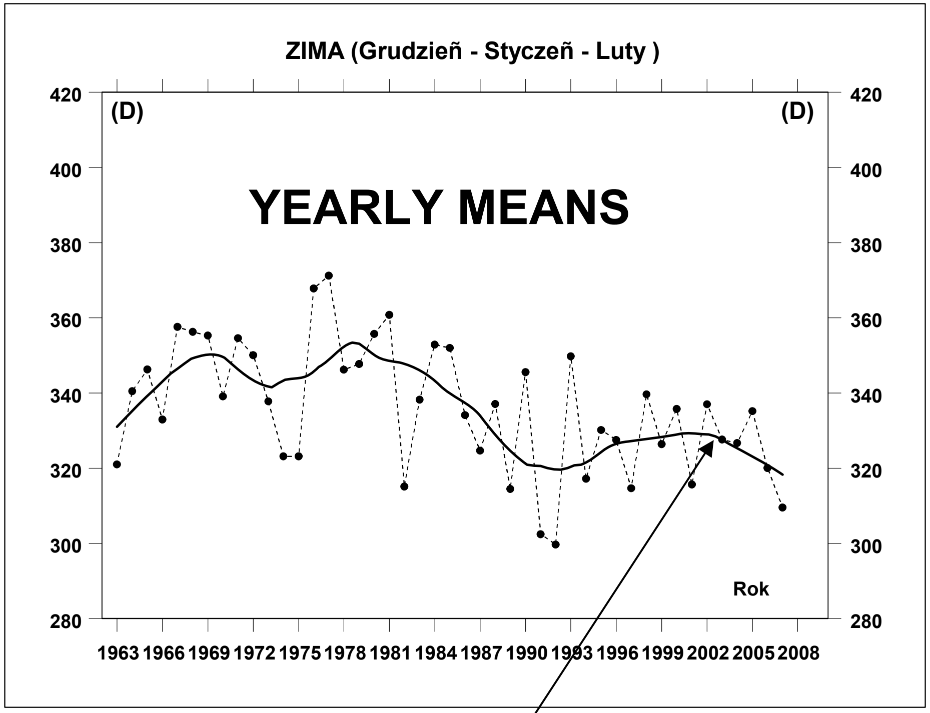
OZONE DECLINE SINCE 2002!

CENTRAL EUROPE

COST726 + OMI DATA: 1963-2008

SELECTED REGION



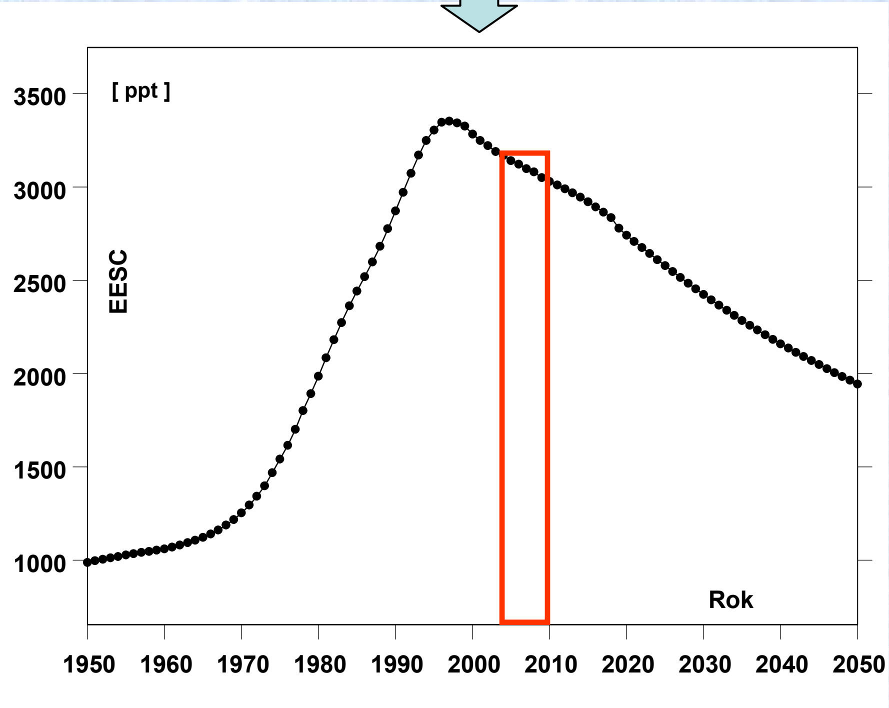


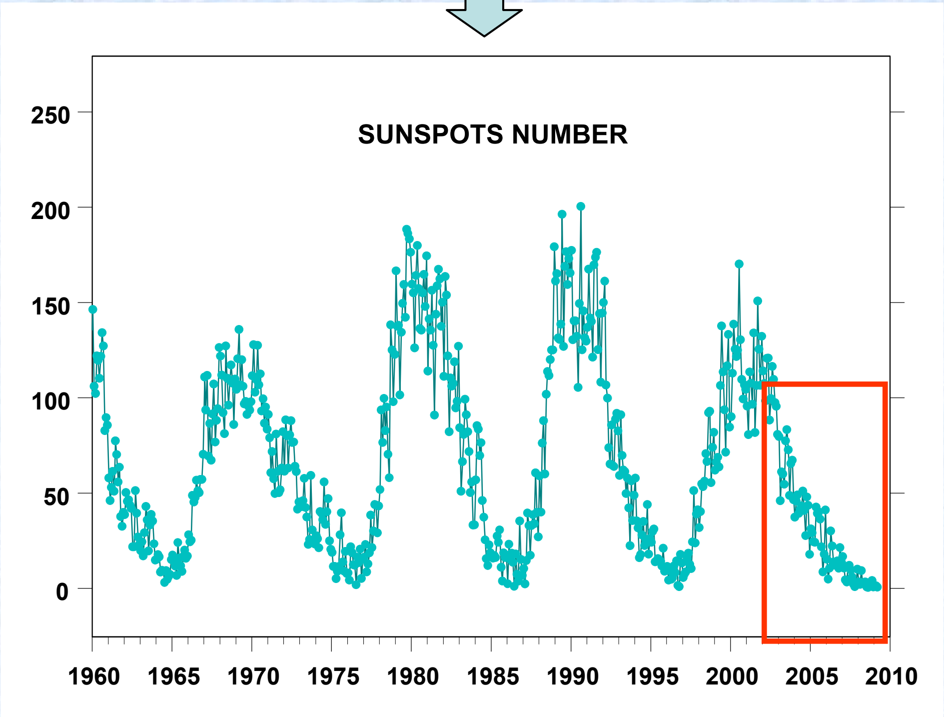
OZONE DECLINE SINCE 2002 !

SOURCES OF RECENT OZONE DECLINE?

Equivalent Effective Stratospheric Chlorine?

SOLAR ACTIVITY?





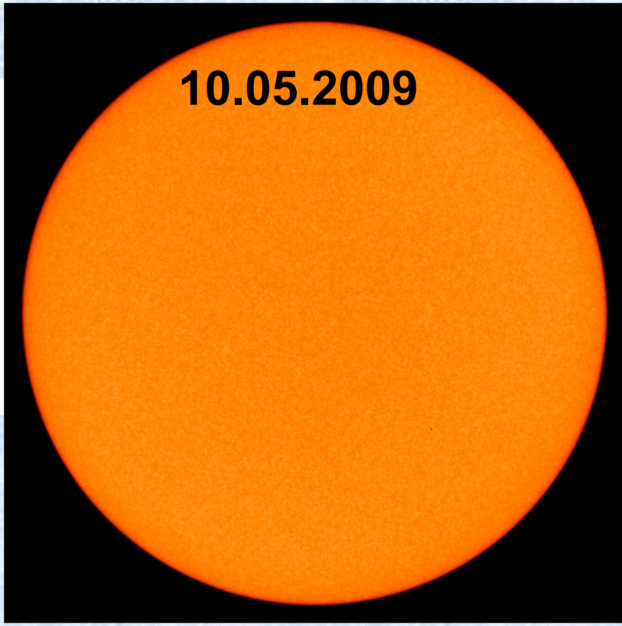
Source:

United Nations Environmental Program (UNEP) Data Base

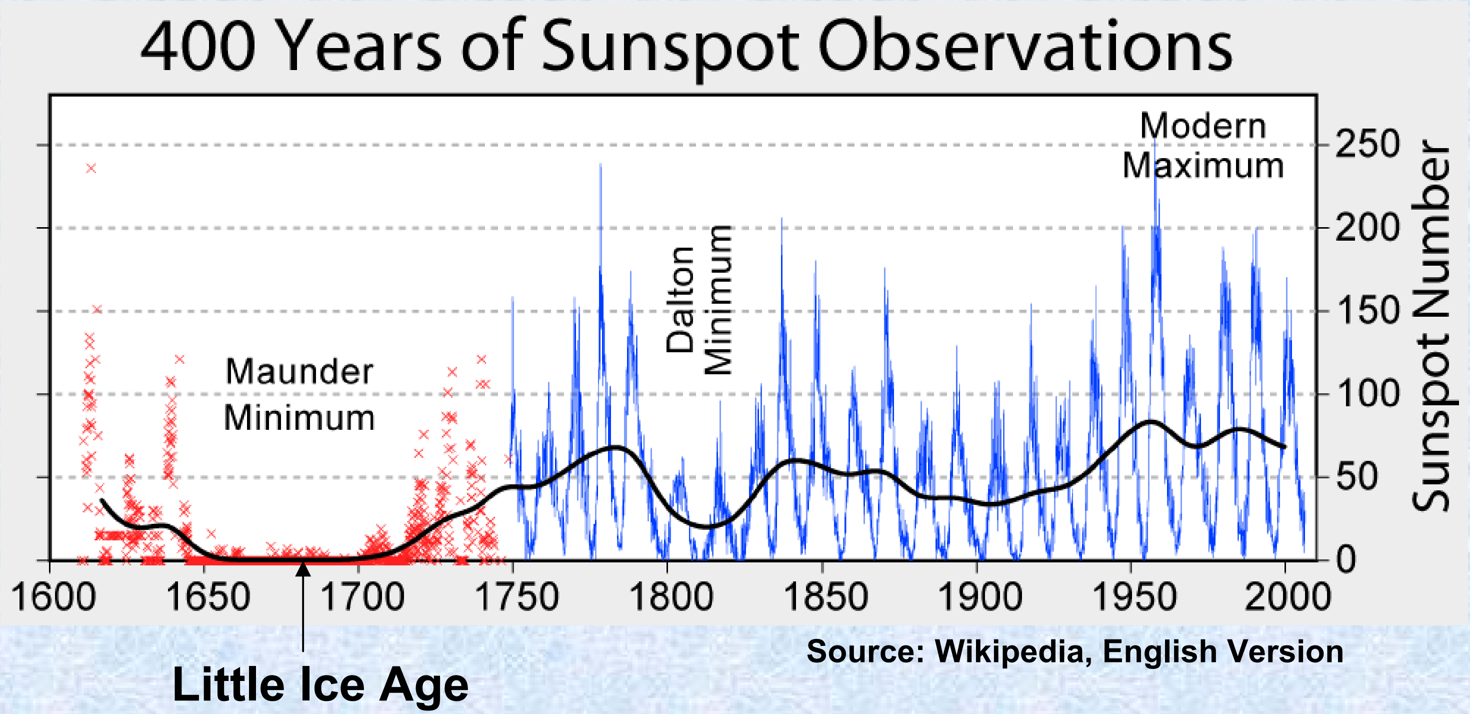
Solar Cycle 24 - early 2008

The longest period without sunspots over last 100 yr.

BEGINING OF A NEW LITTLE ICE AGE?



Source: from the Solar and Heliosphere Observatory spacecraft (SOHO)



Source: Wikipedia, English Version

Thomas Harriot (1560-1621)

Source: Wikipedia, English Version

English astronomer

December 1610 first documented observation of sunspots through telescope = start of solar activity data base

Let's hope that length of ozone/UV data will be similar

CONCLUSIONS

OMI DATA (2005-2008) PROPER FOR EXTENSION OF COST726 DATA BASE

DIFFERENCES GROUND/SATELLITE OZONE WITHIN ± 2% BAND IN THE PERIOD 1979-2008 (30 YR) FOR THE EUROPEAN STATIONS

TREND UP T0 ± 0.7% /10YR. DUE TO CALIBRATION/INSTRUMENTAL CHANGES OF GROUND-BASED NETWORK IN MIDLAT. EUROPE

RECENT (SINCE 2002) TOTAL OZONE DECLINE OVER MIDLAT. EUROPE PROBABLY CAUSED BY THE LOW SOLAR ACTIVITY

PROLONGED BLANK PHASE OF THE SUN WILL POSE A CHALLENGE FOR OUR UNDERSTANDING OF SUN/EARTH ATMOSPHERE RELATIONSHIP

SOMETHING UNEXPECTED IN UV/OZONE SCIENCE MAY HAPPEN IF THE SOLAR ACTIVITY STAYS LOW MUCH LONGER