

Plans to combine long term European total ozone date sets with USA data sets

CEOS ACC Meeting, ESRIN/Frascati, 28 April 2014

D. Loyola (DLR), M. Coldewey-Egbers (DLR),
G. Labow (NASA), S. Frith (NASA),



Knowledge for Tomorrow

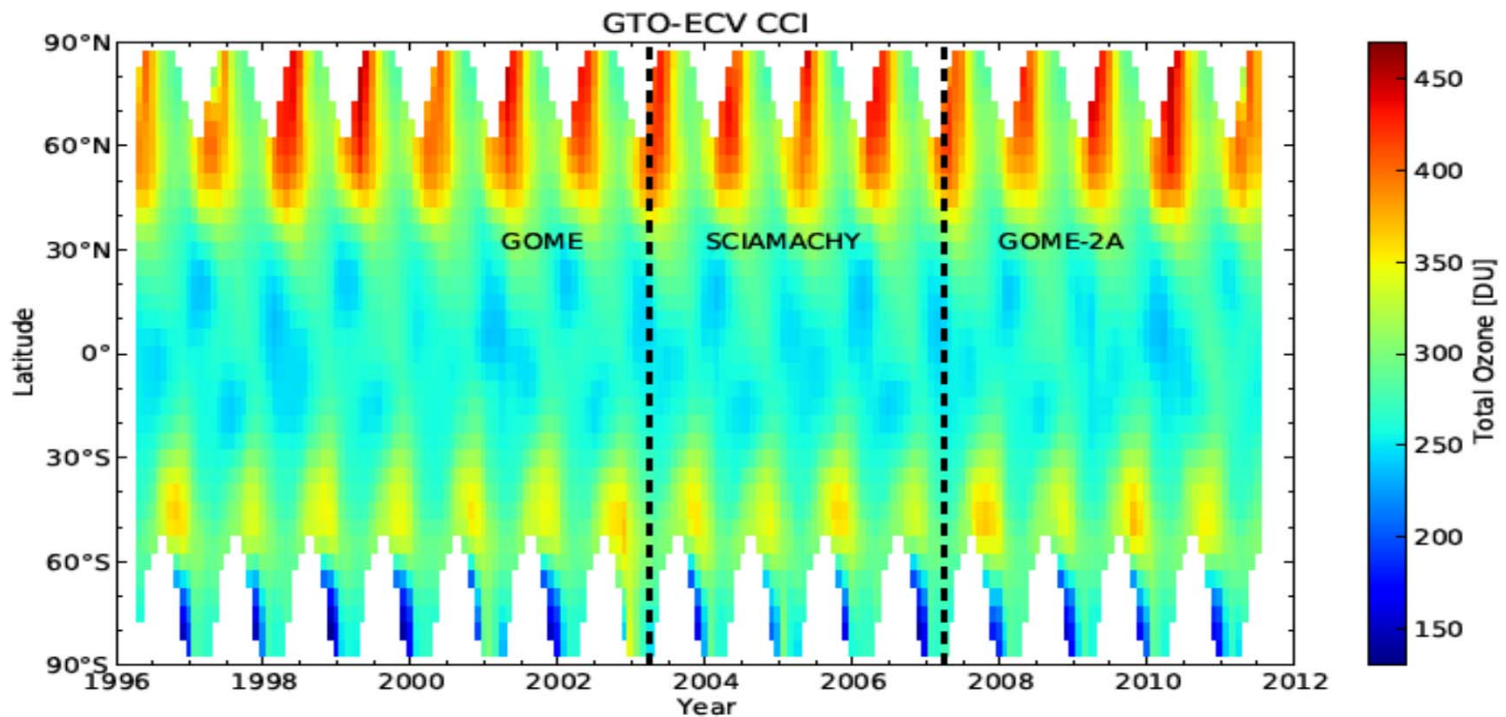
Outline

- GTO-ECV
 - Dataset
 - Sampling errors & Validation
 - CCI Phase II extension & Trends
- GTO-ECV and SBUV-MOD comparison
 - Zonal Mean
 - Grid data
- Outlook



GTO-ECV: Homogenized Total Ozone L3 Dataset

- Based on GODFIT L2 version 3.0
- Merge GOME/ERS-2, SCIAMACHY/ENVISAT, and GOME-2/MetOp-A
- Monthly 1x1° grid data in NetCDF CF 1.5



GTO-ECV: Merging Algorithm in CCI Phase-I

Atmos. Meas. Tech. Discuss., 8, 1–46, 2015
www.atmos-meas-tech-discuss.net/8/1/2015/
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Atmospheric
Measurement
Techniques
Discussions
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This discussion paper is/has been under review for the journal Atmospheric Measurement Techniques (AMT). Please refer to the corresponding final paper in AMT if available.

The GOME-type Total Ozone Essential Climate Variable (GTO-ECV) data record from the ESA Climate Change Initiative

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GTO-ECV CCI Level 3
M. Coldewey-Egbers
et al.

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Interactive Discussion

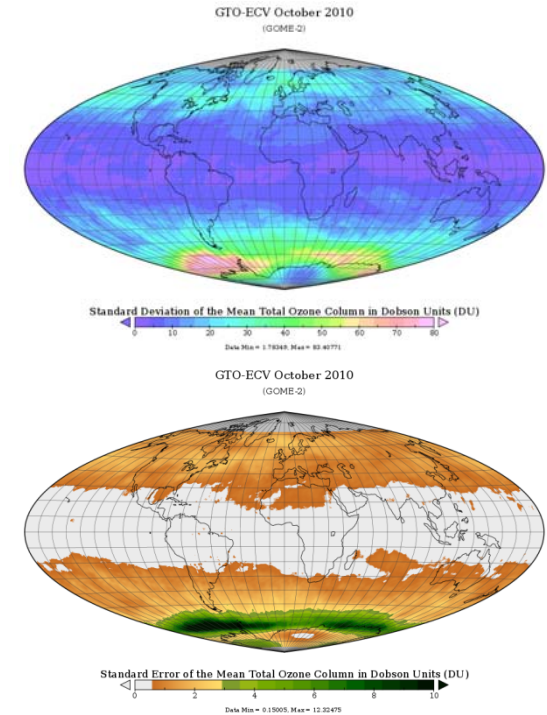
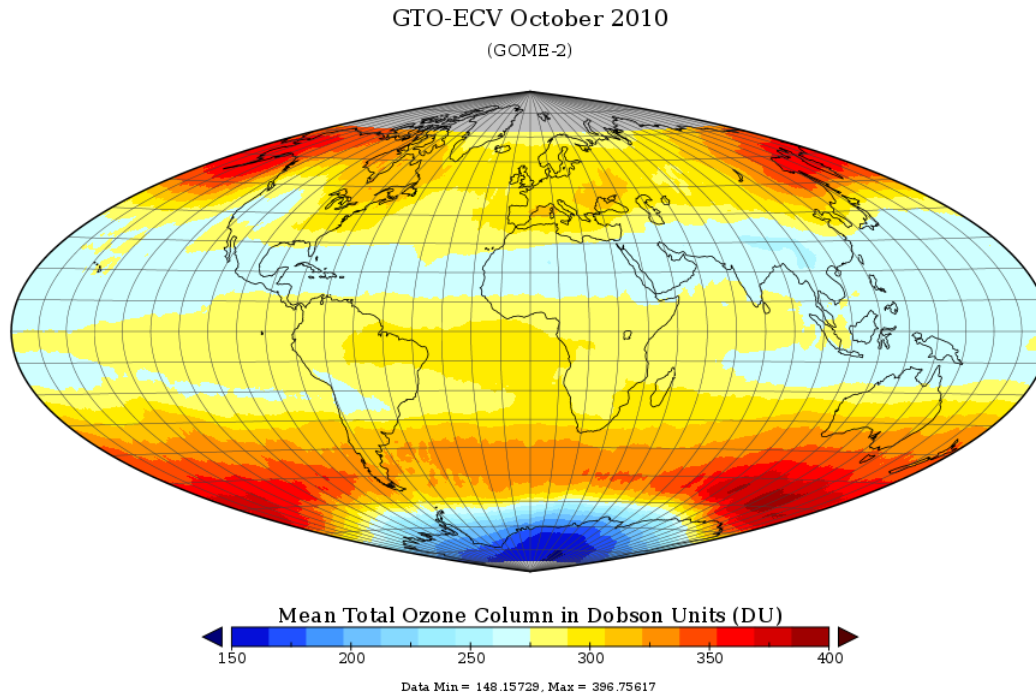
Discussion Paper | Discussion Paper | Discussion Paper | Discussion Paper | Discussion Paper

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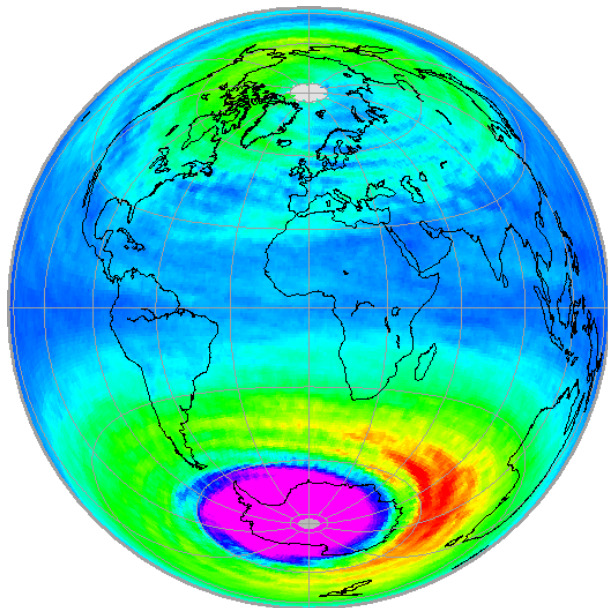


GTO-ECV: Product Content

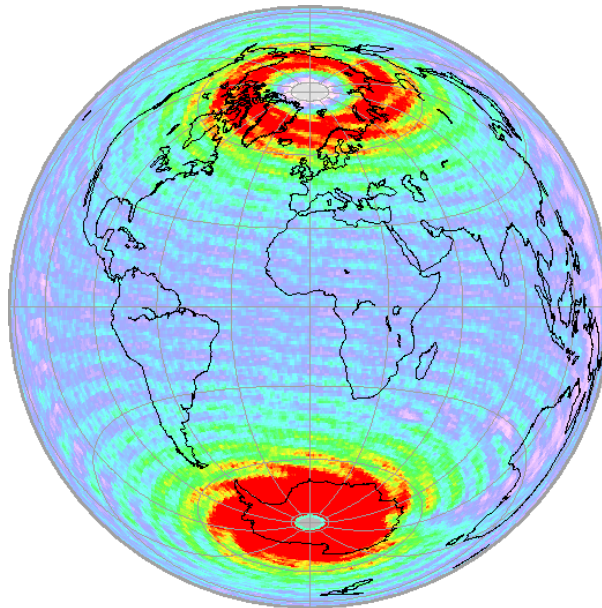
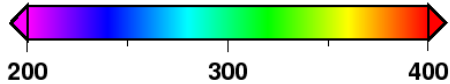
- Monthly mean total ozone
- Standard deviation
- **Standard error** estimated using an OSSE



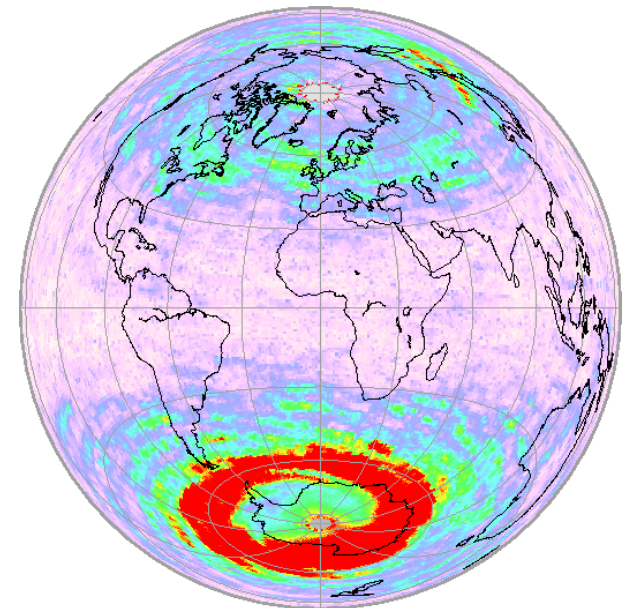
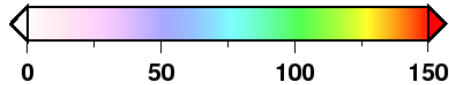
GTO-ECV: Sampling Error Characterization (SCIA)



O₃ [Dobson Units]



Measurements [-]

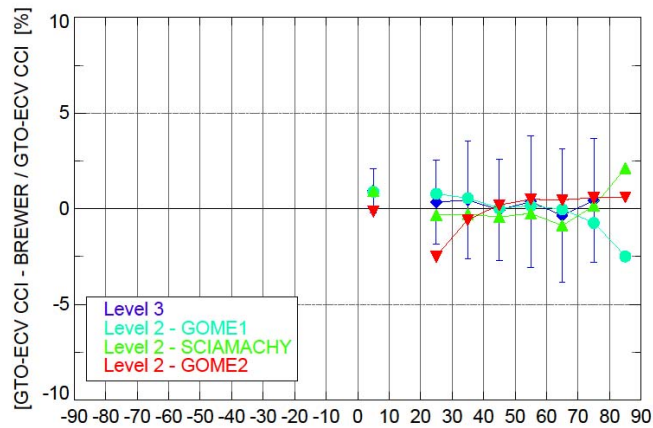


SEM [DU]

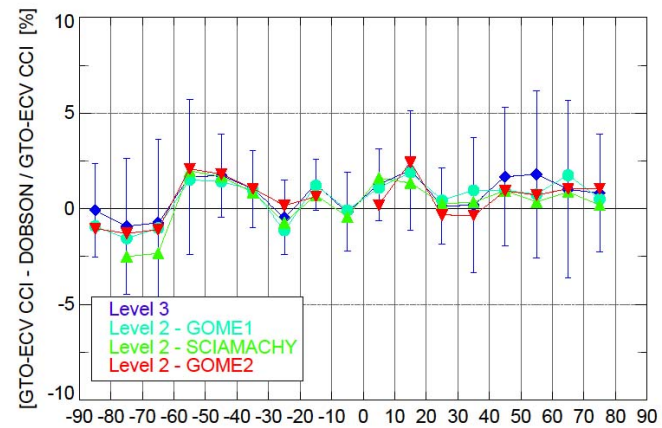


GTO-ECV: Ground-Based Validation

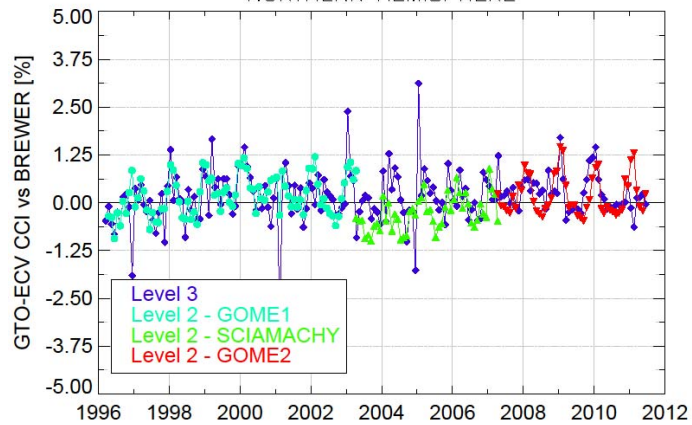
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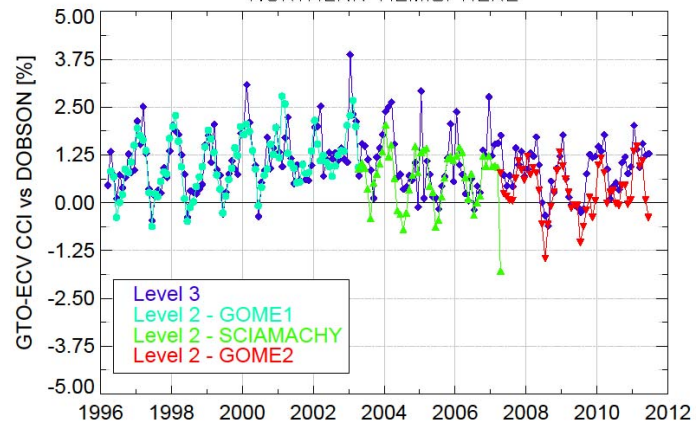
Dobson



NORTHERN HEMISPHERE



NORTHERN HEMISPHERE

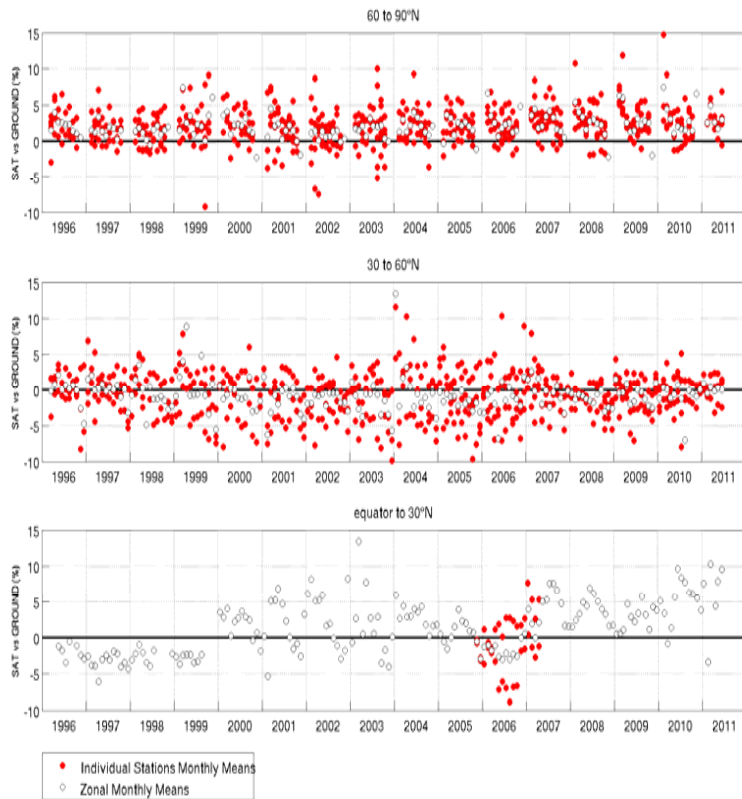


Courtesy of M. Koukouli, AUTH

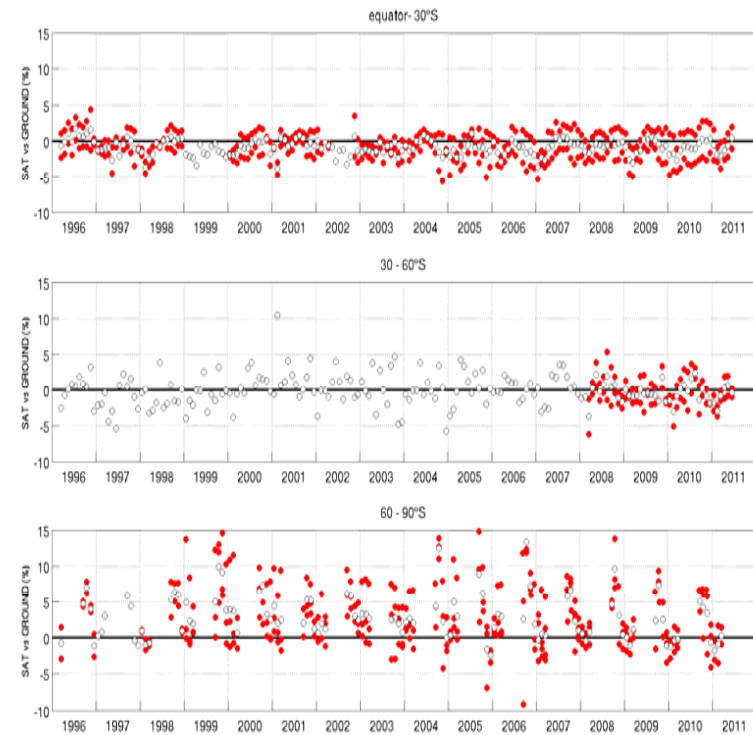


GTO-ECV: Ground-Based Validation (2)

SAOZ Northern Hemisphere



SAOZ Southern Hemisphere

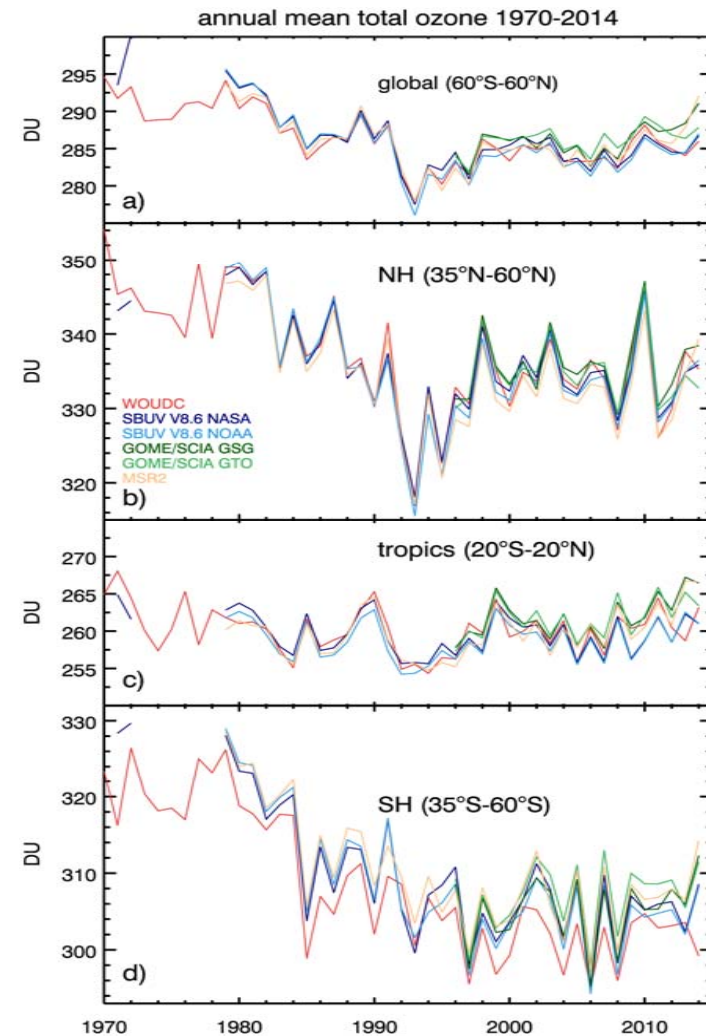


Courtesy of T. Verhoelst + J. Granville, BIRA



Extended GTO-ECV: Ozone_CCI Phase II

- GODFIT L2 from GOME in 1995 and GOME-2A/MetOp-A data from 2012-2014 now available
- GTO-ECV extend from June 1995 to December 2014
- Extended dataset has been included in:
 - „Stratospheric Ozone“ section of „The State of the Climate 2014“ submitted to BAMS; Weber et al., 2015.
 - WMO Assessment of Ozone Depletion: 2014, WMO Report No. 55, 2015.



Courtesy of M. Weber, IUP



Extended GTO-ECV: Ozone Trend Detection

Geophysical Research Letters

RESEARCH LETTER

10.1002/2014GL060212

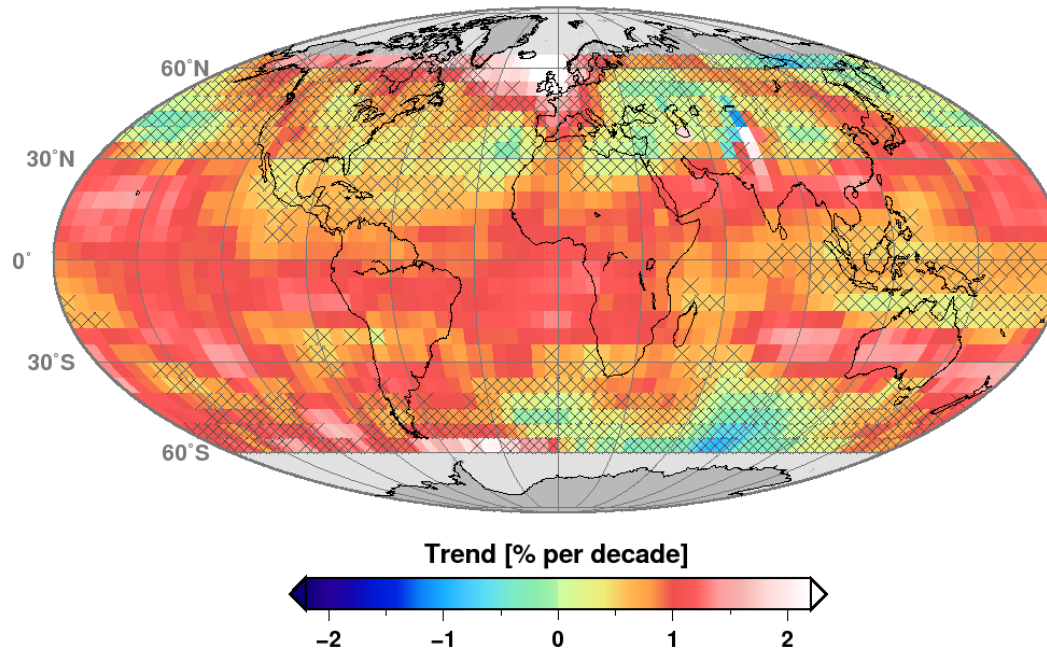
A new health check of the ozone layer at global and regional scales

Key Points:

- Global assessment of ozone trends

Melanie Coldewey-Egbers¹, Diego G. Loyola R.¹, Peter Braesicke², Martin Dameris³, Michel van Roozendael⁴, Christophe Lerot⁴, and Walter Zimmer¹

(a) GTO-ECV CCI Total Ozone



(b) GTO-ECV CCI Expected Trend Detection

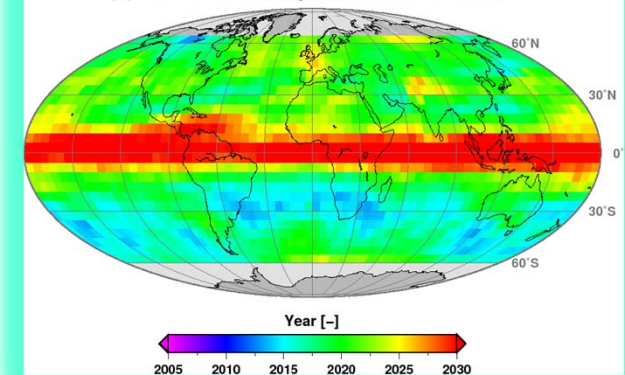


Chart 10



GTO-ECV and SBUV-MOD Comparison

Comparison of profile total ozone from SBUV (v8.6) with GOME-type and ground-based total ozone for a 16-year period (1996 to 2011)

Atmospheric
Measurement
Techniques



E. W. Chiou¹, P. K. Bhartia², R. D. McPeters², D. G. Loyola³, M. Coldewey-Egbers³, V. E. Fioletov⁴, M. Van Roozendael⁵, R. Spurr⁶, C. Lerot⁵, and S. M. Frith⁷

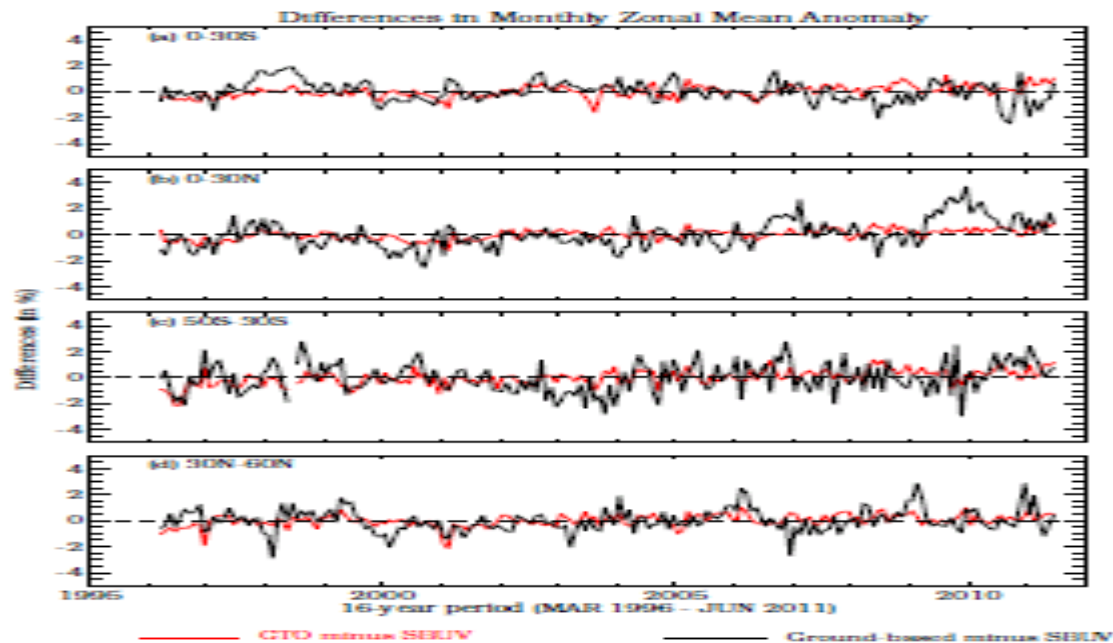
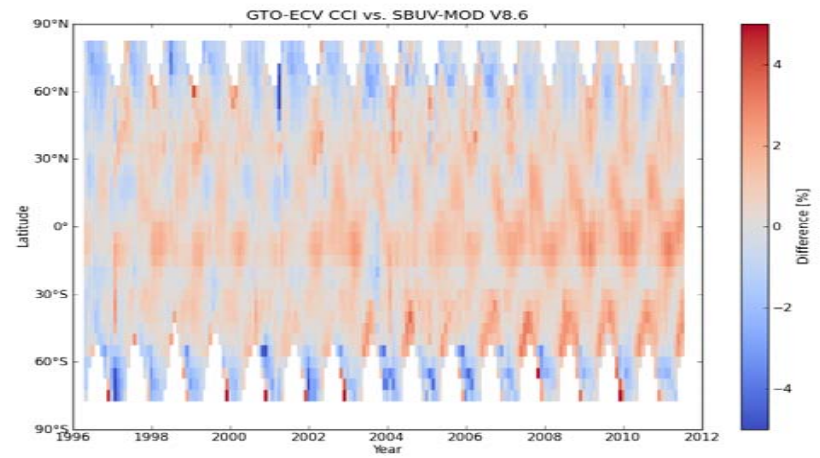
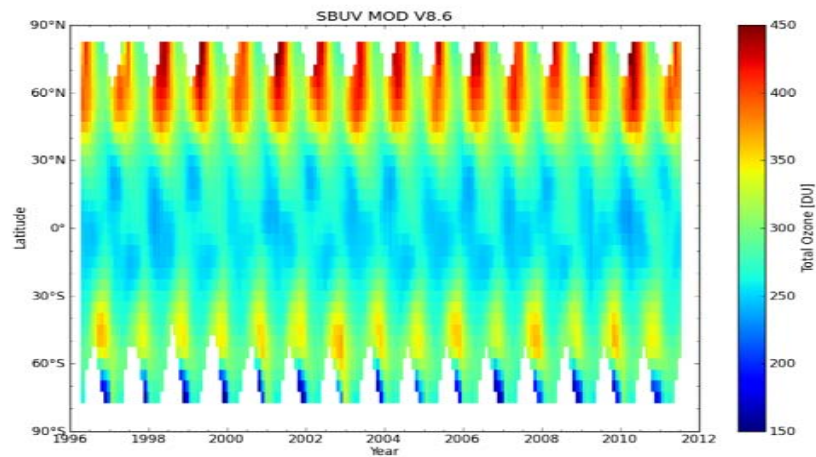
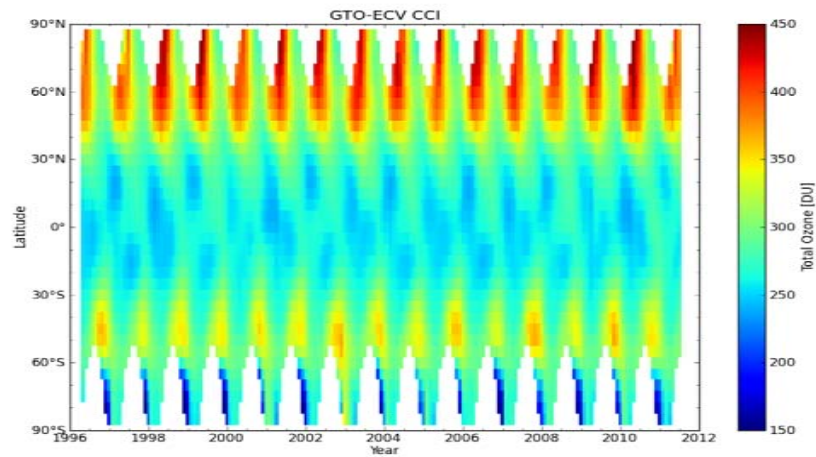


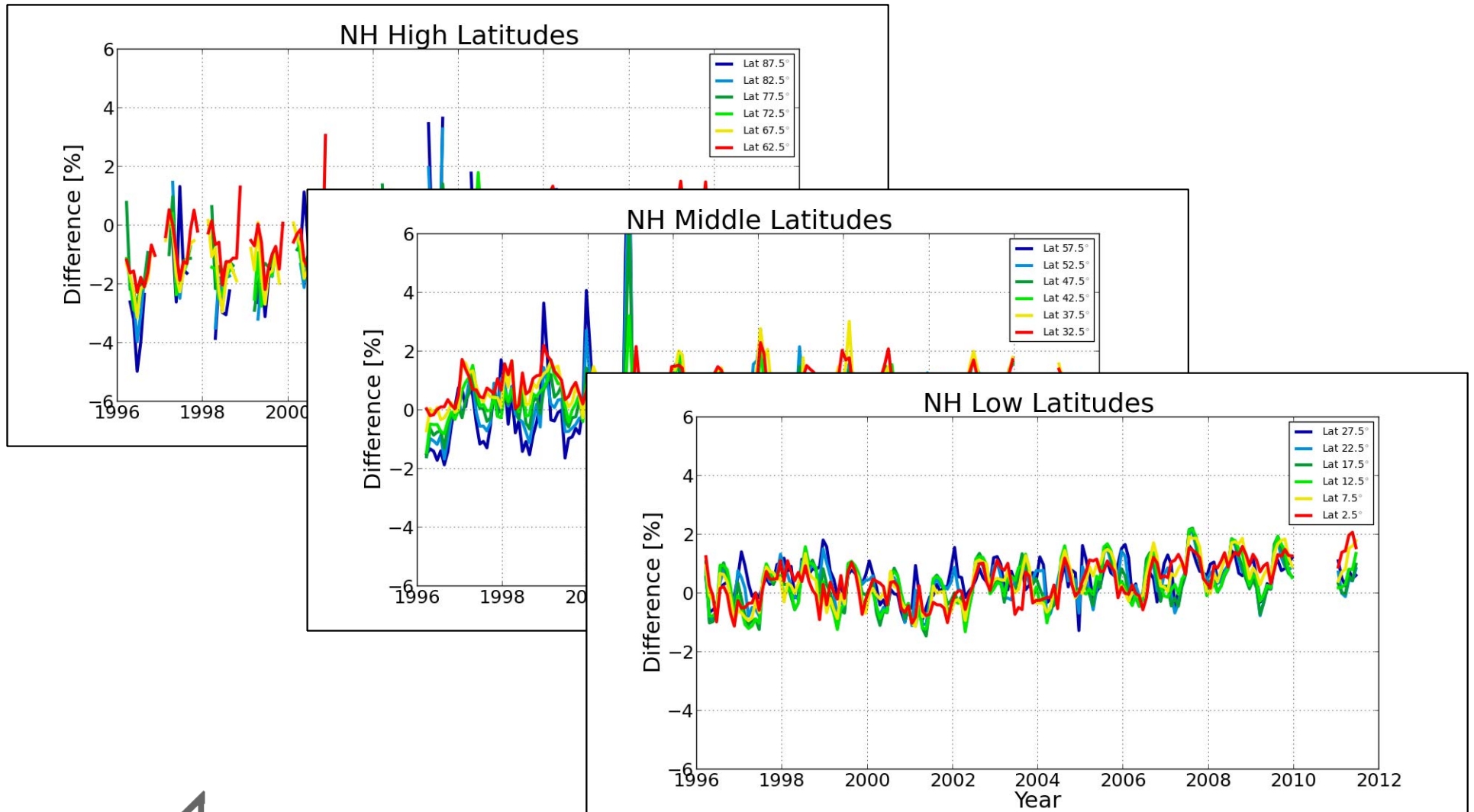
Chart 11



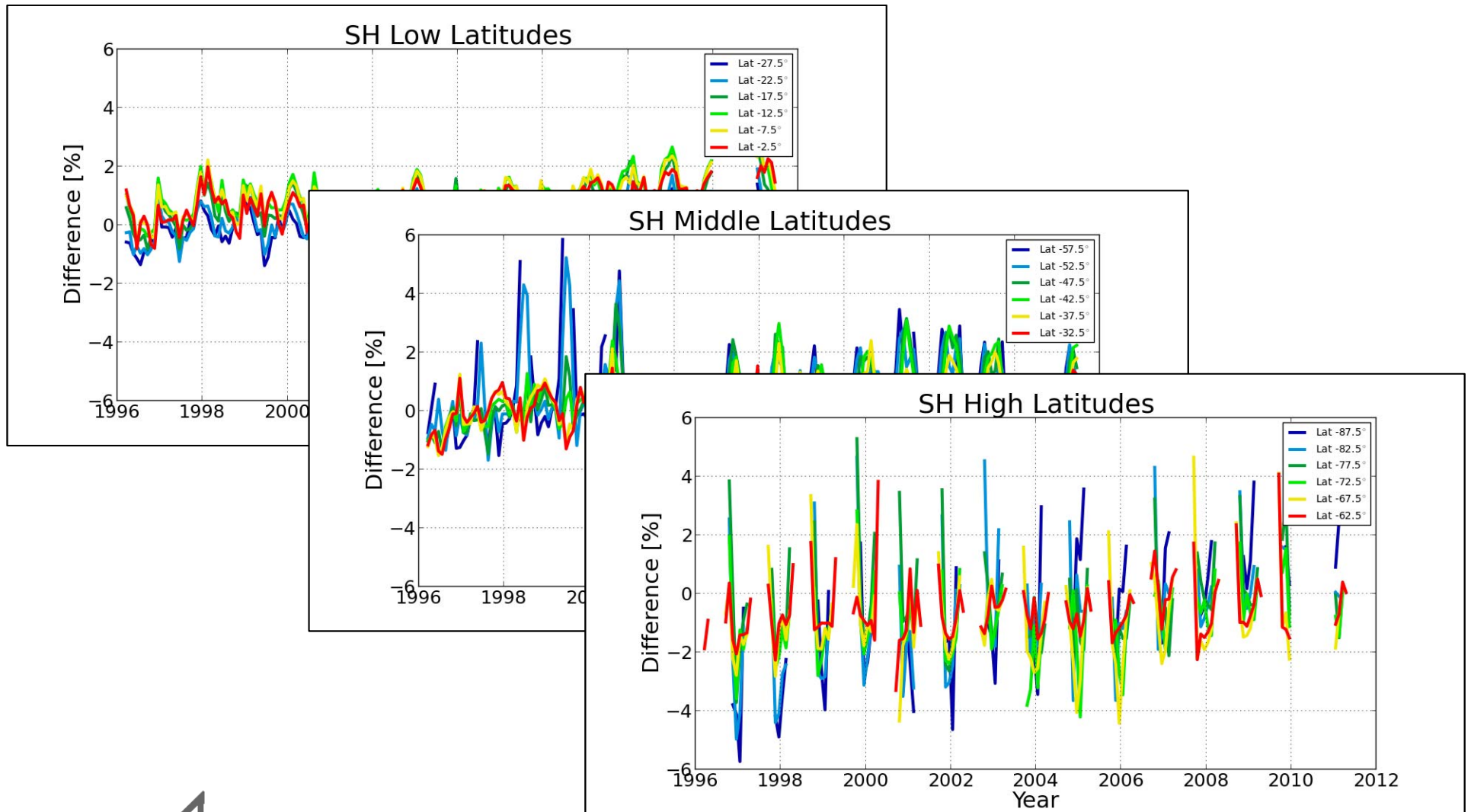
GTO-ECV vs. SBUV-MOD: Total Ozone



GTO-ECV vs. New SBUV MOD: Zonal Mean NH



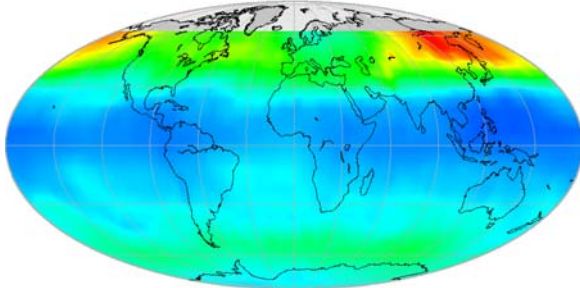
GTO-ECV vs. New SBUV-MOD: Zonal Mean SH



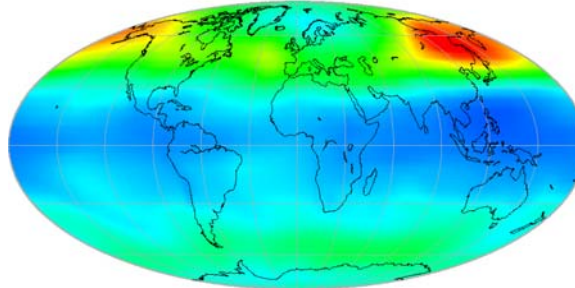
GTO-ECV vs. New SBUV-MOD: GOME (1996)

January

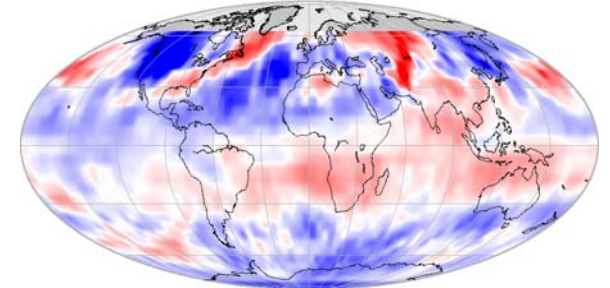
GTO_{ECV} Total Ozone: 1996-01



SBUV_{MOD} Total Ozone: 1996-01

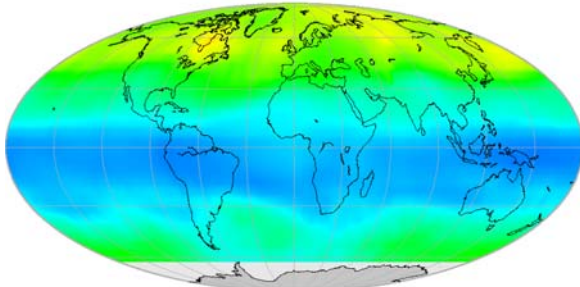


GTO_{ECV} - SBUV_{MOD}: 1996-01

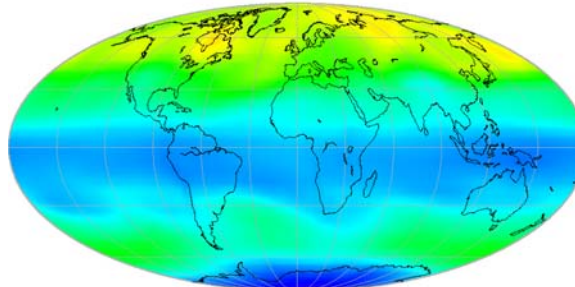


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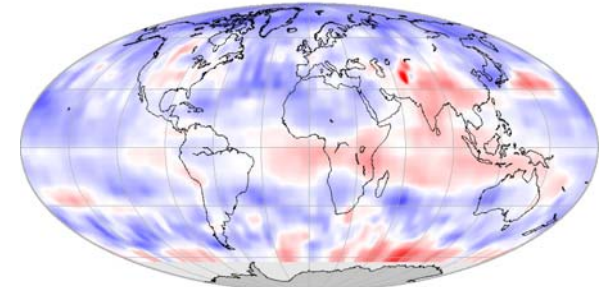
GTO_{ECV} Total Ozone: 1996-05



SBUV_{MOD} Total Ozone: 1996-05

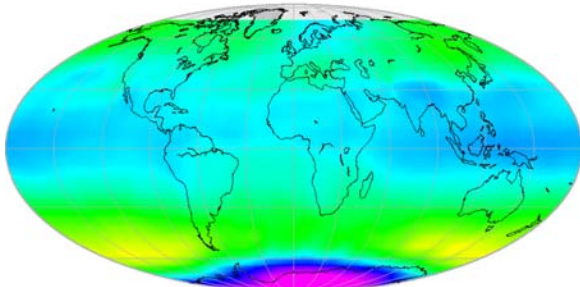


GTO_{ECV} - SBUV_{MOD}: 1996-05

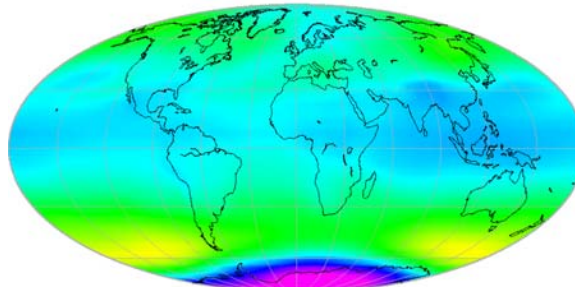


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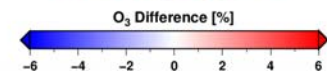
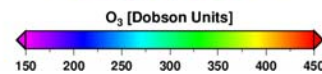
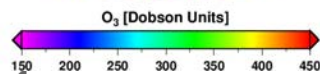
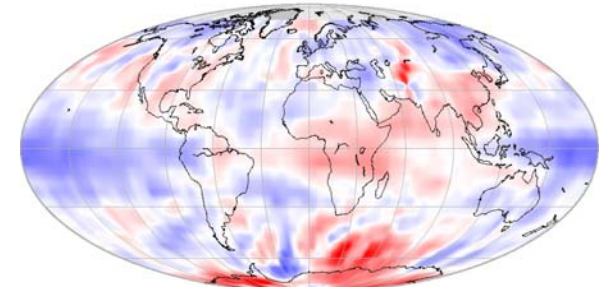
GTO_{ECV} Total Ozone: 1996-10



SBUV_{MOD} Total Ozone: 1996-10



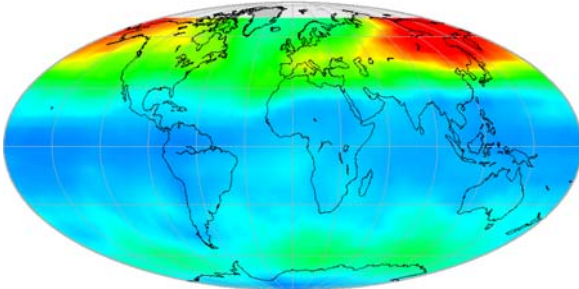
GTO_{ECV} - SBUV_{MOD}: 1996-10



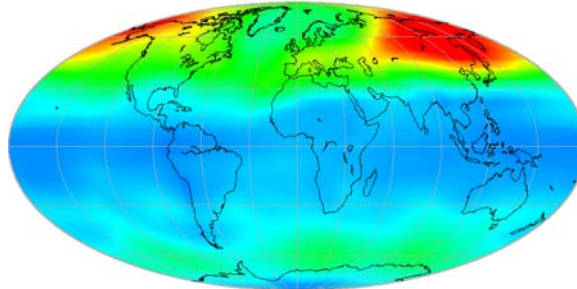
GTO-ECV vs. New SBUV-MOD: SCIA (2005)

February

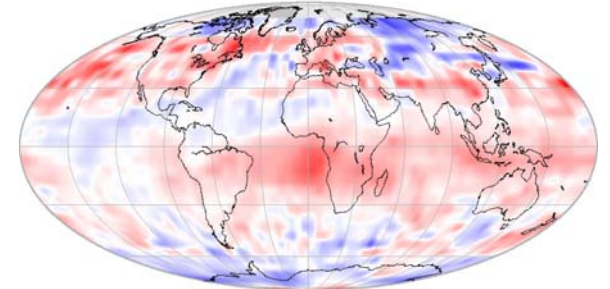
GTO_{ECV} Total Ozone: 2005-02



SBUV_{MOD} Total Ozone: 2005-02

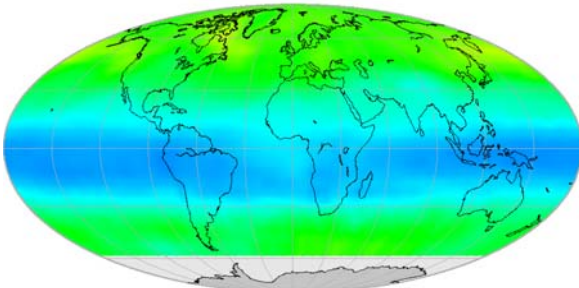


GTO_{ECV} - SBUV_{MOD}: 2005-02

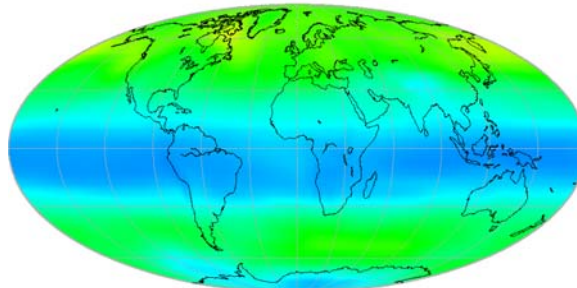


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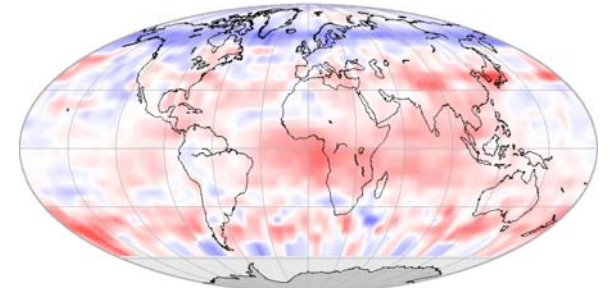
GTO_{ECV} Total Ozone: 2005-06



SBUV_{MOD} Total Ozone: 2005-06

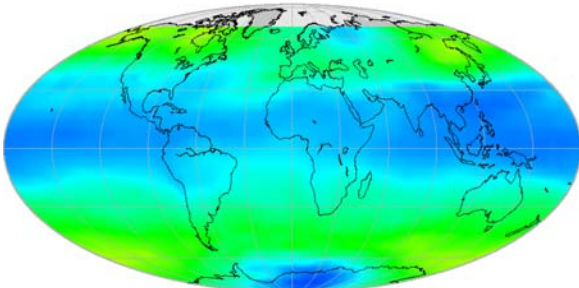


GTO_{ECV} - SBUV_{MOD}: 2005-06

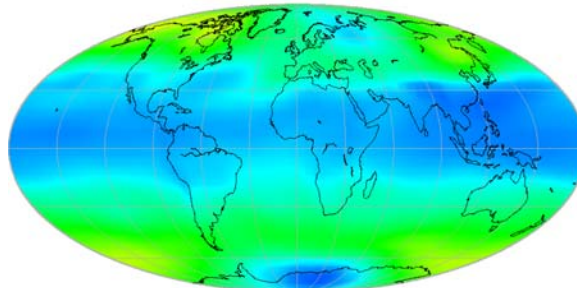


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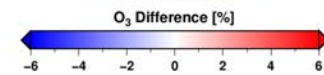
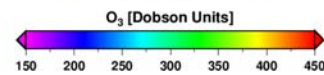
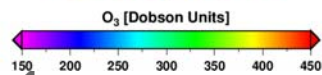
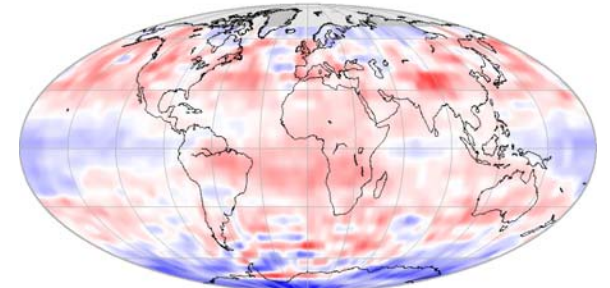
GTO_{ECV} Total Ozone: 2005-11



SBUV_{MOD} Total Ozone: 2005-11



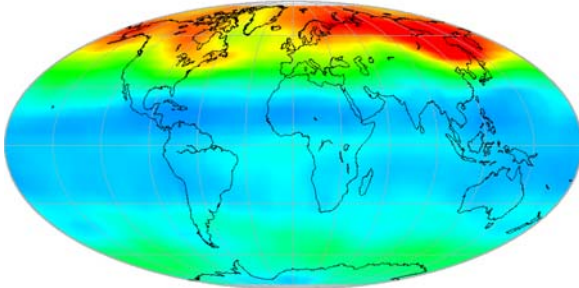
GTO_{ECV} - SBUV_{MOD}: 2005-11



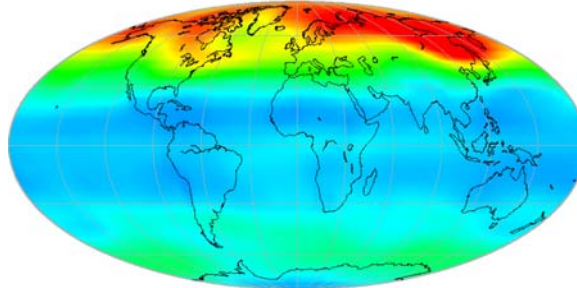
GTO-ECV vs. New SBUV-MOD: GOME-2 (2013)

March

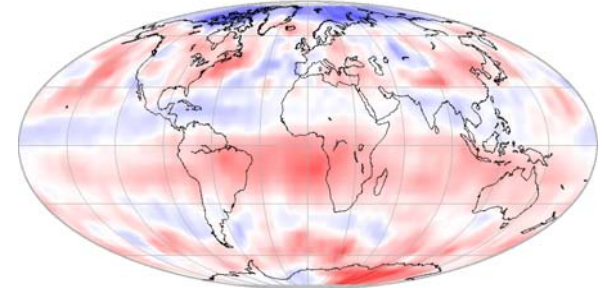
GTO_{ECV} Total Ozone: 2013-03



SBUV_{MOD} Total Ozone: 2013-03

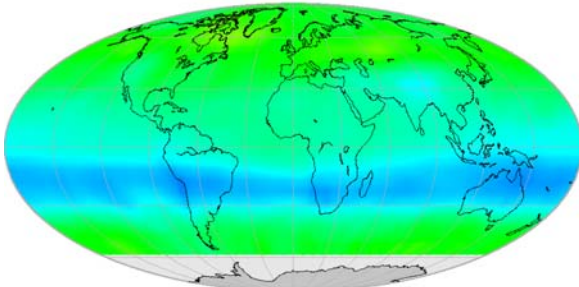


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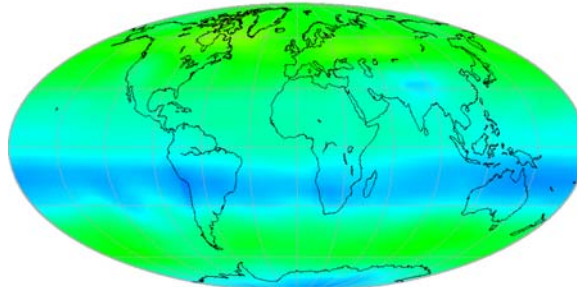


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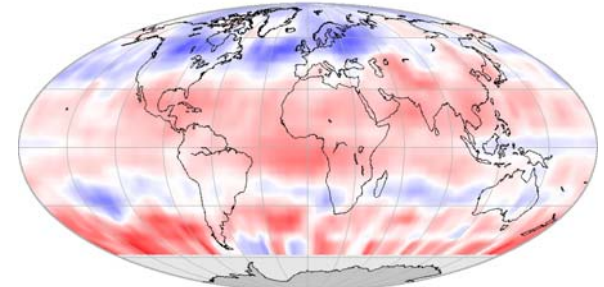
GTO_{ECV} Total Ozone: 2013-07



SBUV_{MOD} Total Ozone: 2013-07

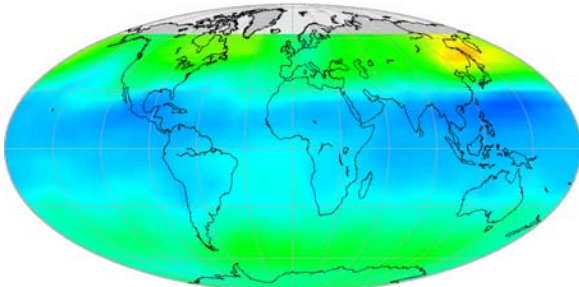


GTO_{ECV} - SBUV_{MOD}: 2013-07

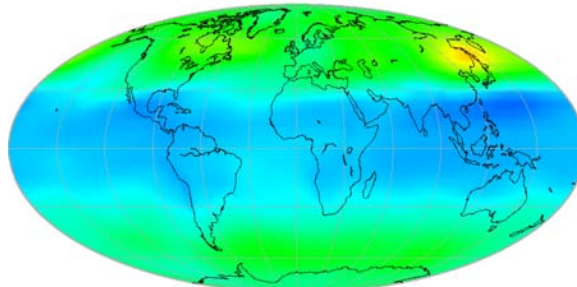


December

GTO_{ECV} Total Ozone: 2013-12



SBUV_{MOD} Total Ozone: 2013-12



GTO_{ECV} - SBUV_{MOD}: 2013-12

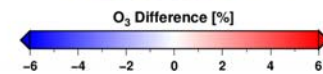
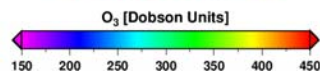
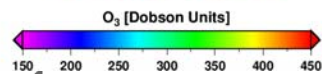
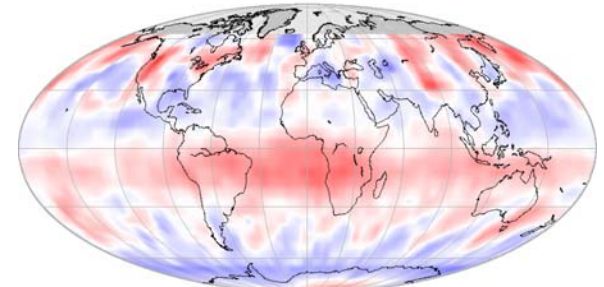


Chart 17

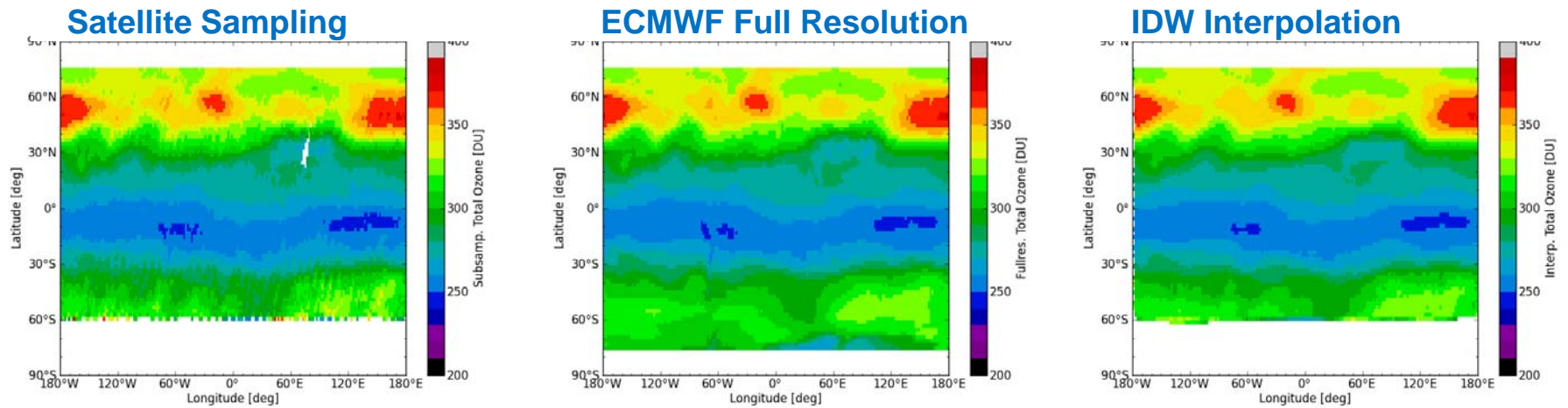


ESA CCI Phase II

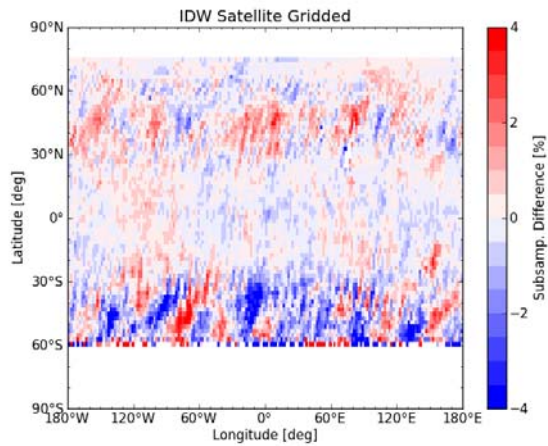
- Extend GTO-ECV with OMI and GOME-2/MetOp-B
- Geo-statistical spatial-temporal interpolation of daily satellite data using:
 - Inverse-Distance-Weighting
 - Kriging
 - Radial Basis Functions
 - Discrete Cosine Transform
 - ...
- Compare the new GTO-ECV and SBUV-MOD data in collaboration with the NASA team



IDW Interpolation: Impact on monthly means



Satellite – Full.Res.



IDW Interp. – Full.Res.

