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UV monitoring and forecasting capabilities developed within the ECMWF Integrated Forecast System

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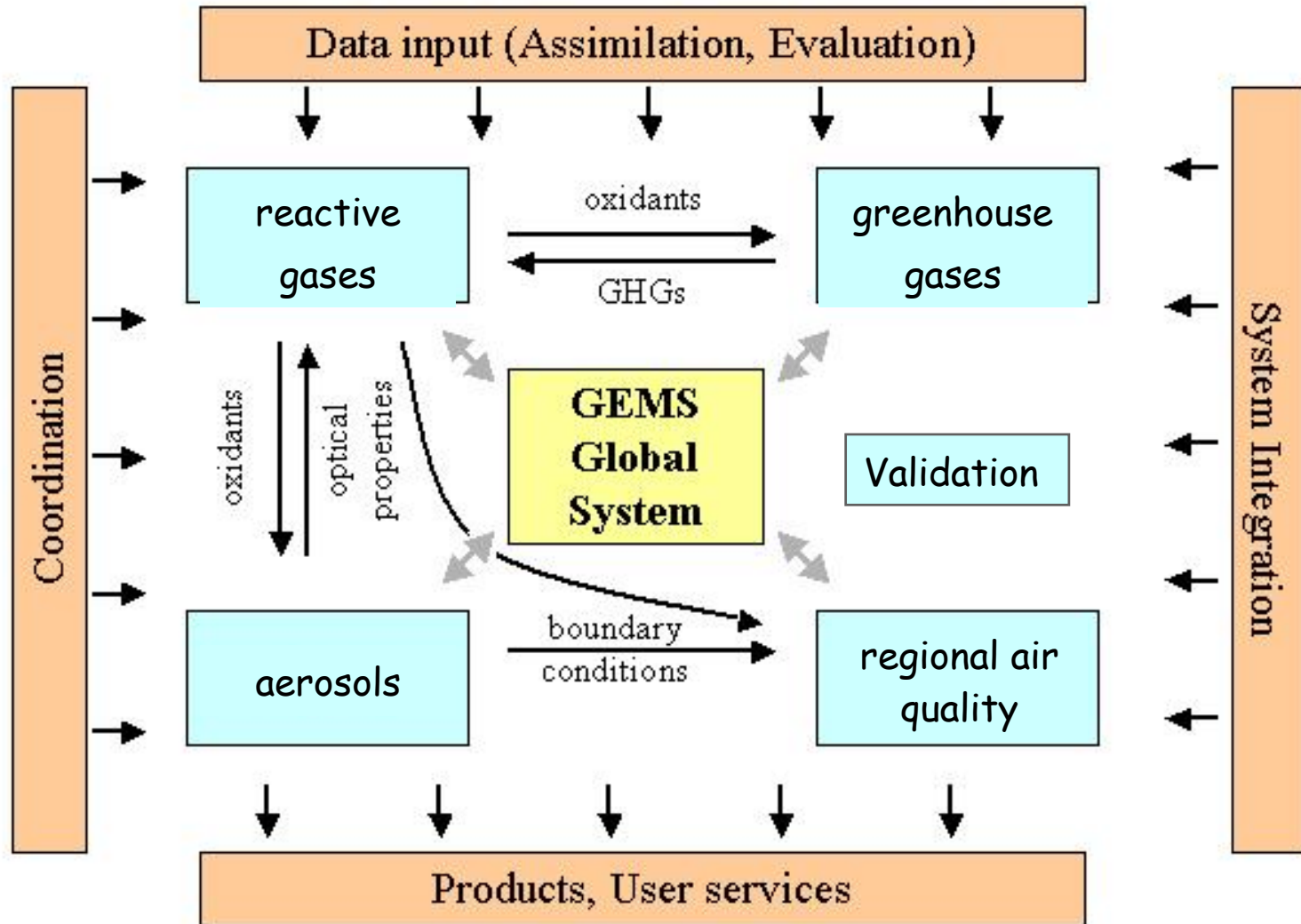
GEMS: Global Earth-system Monitoring using Space and in-situ data

Coordinator: ECMWF (European Centre for Medium-
Range Weather Forecasts)

Fundamental Objective: Extend the modelling and data-assimilation methods of Numerical Weather Prediction to atmospheric composition incl. Greenhouse gases, Reactive gases, Aerosol.



GEMS organization in 6 sub-projects





A Processor to get UV-B and UV-A radiation products in/from the ECMWF IFS, J.-J. Morcrette and A. Arola, June 2007, *ECMWF Technical Memo. No. 528*, 25 pp.

Available from:

<http://www.ecmwf.publications/library/do/references/list/14>



A Processor to get UV ...

- It uses a two-stream Delta-Eddington formalism similar to that of the ECMWF SW code ([Fouquart and Bonnel, 1980](#); [Morcrette, 2002](#)), but applied to 24 / 120 / 600 spectral intervals of width 5 / 1 / 0.2 nm to describe the radiative transfer over the spectral band 280-400 nm.
- It is fully interactive with the T, q, cloud fraction, cloud ice, cloud water, aerosols, surface conditions provided by the ECMWF Integrated Forecast System.



A Processor to get UV ...

- Aerosol information is taken from the 6-aerosol type monthly climatologies present in the IFS (in future, from aerosol analysis provided by GEMS-AER).
- Cloud optical characteristics (effective radius of liquid water clouds, effective particle size of ice clouds, scattering and absorption coefficients, single scattering albedos, asymmetry factors) are fully consistent with the ones used in the operational SW scheme.



A Processor to get UV ...

- Surface boundary conditions are provided using the UV-visible direct and diffuse land surface albedos derived from MODIS SW channels by the Boston University group (Schaaf et al., 2002, RSE, 83, 135-148).
- This processor has been used for UV computations over the GEMS 2003-2004 official reference period, over 2005 for comparison with OMI and surface station measurements, and in a pre-operational mode at TL159 L91 since 20070601.



A Processor to get UV ...

- UV CIE weighted dose for the cloudy atmosphere and for the equivalent clear sky conditions are available from a 72-hour near-real time forecasts with a time-step of 1 hour from:

<http://www.ecmwf.int/products/forecasts/d/inspect/catalog/research/gems/grg/uv/>



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ECMWF graphical product catalogue > Research > Gems > Global Reactive Gases > UV Products > Biologically Effective UV Dose>

Biologically Effective UV Dose

Parameter

UV Clear
UV Total

Step (-> valid time)

01 (Thu 13 Sep 2007 01UTC)

Forecast base time

Thu 13 Sep 2007 00UTC

Base time finder

Forecast base times with forecast valid for the displayed valid time: Thu 13 Sep 01UTC

Thu 13 Sep 00UTC

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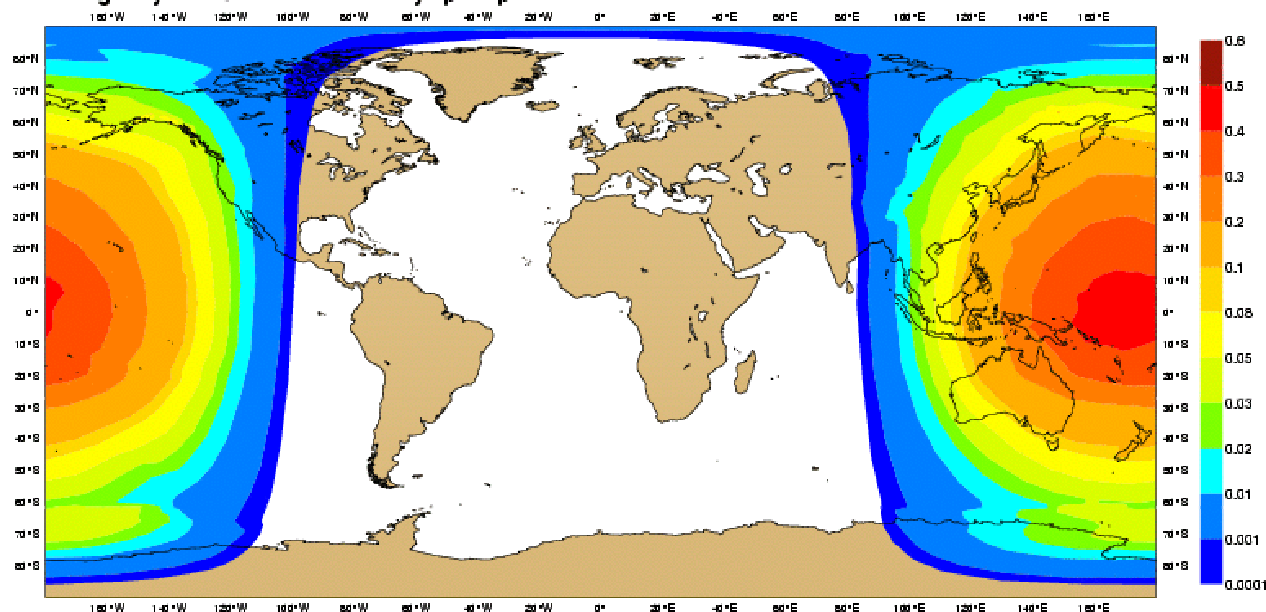
Show overview

Parameter

Step (-> valid time)

Forecast base time

Thursday 13 September 2007 00UTC ECMWF/GEMS Forecast t+001 VT: Thursday 13 September 2007 01UTC
Biologically Effective Dose: Clear Sky pre-oper vers.0





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ECMWF graphical product catalogue > Research > Gems > Global Reactive Gases > UV Products > Biologically Effective UV Dose>

Biologically Effective UV Dose

Parameter

Step (-> valid time)

Forecast base time

UV Clear

UV Total

10 (Thu 13 Sep 2007 10UTC)

Thu 13 Sep 2007 00UTC

Base time finder

Forecast base times with forecast valid for the displayed valid time: Thu 13 Sep 10UTC

Thu 13 Sep 00UTC

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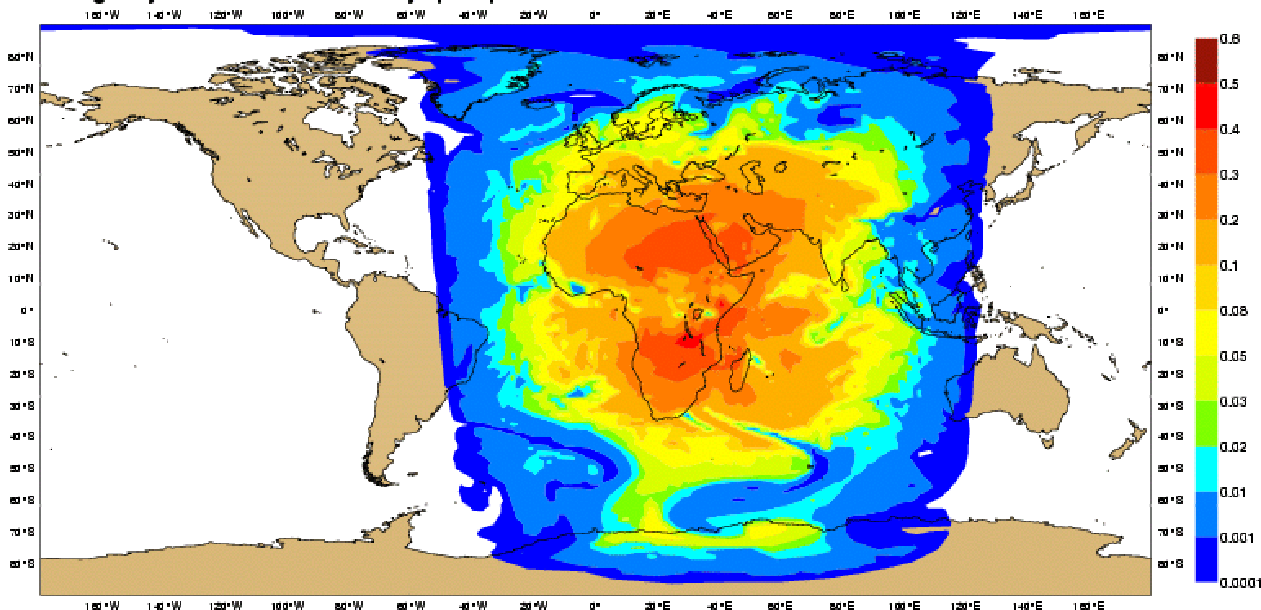
Show overview

Parameter

Step (-> valid time)

Forecast base time

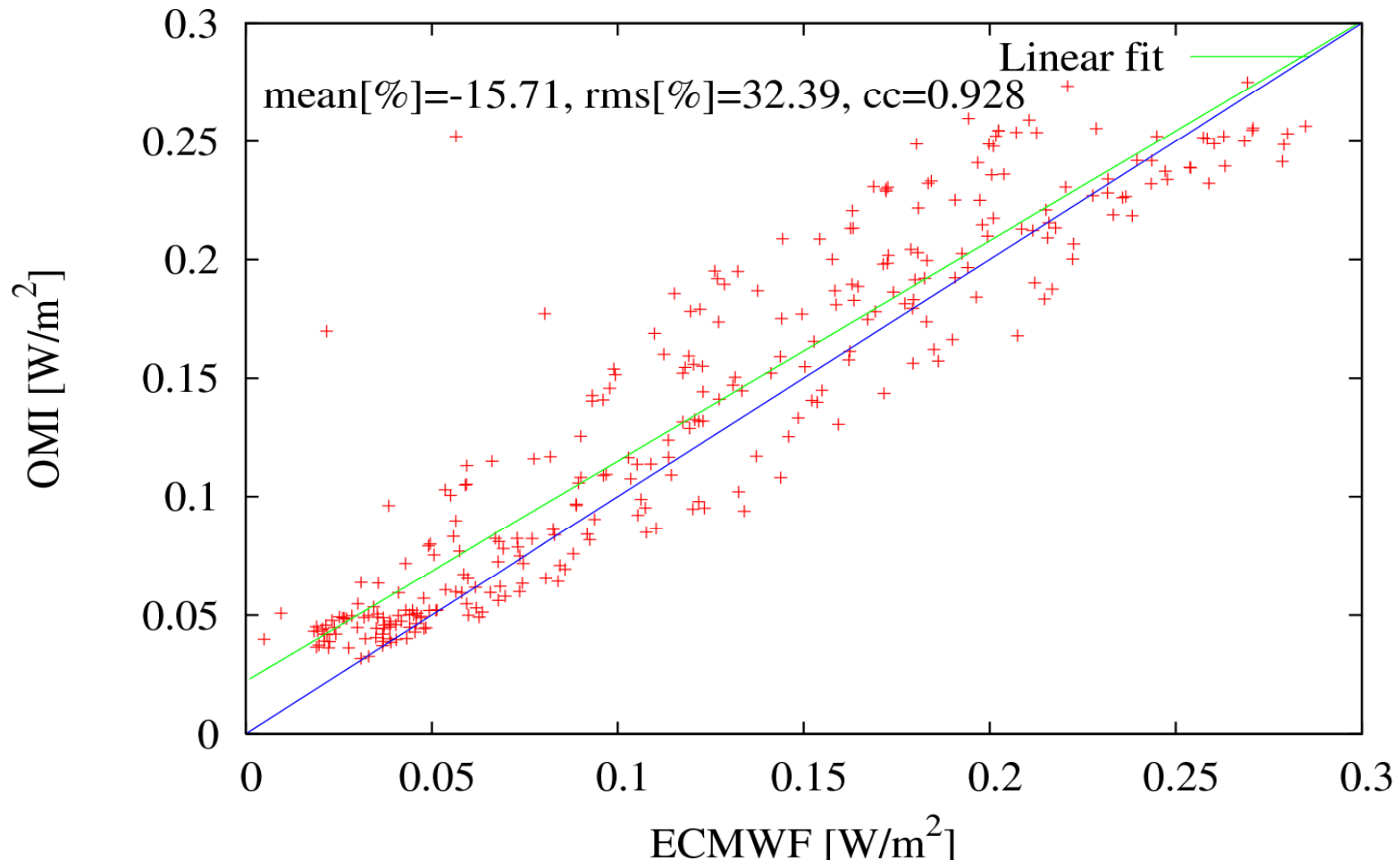
Thursday 13 September 2007 00UTC ECMWF/GEMS Forecast t+010 VT: Thursday 13 September 2007 10UTC
Biologically Effective Dose: Total Sky pre-oper vers.0





Clear-sky CIE at noon against OMI, 2005

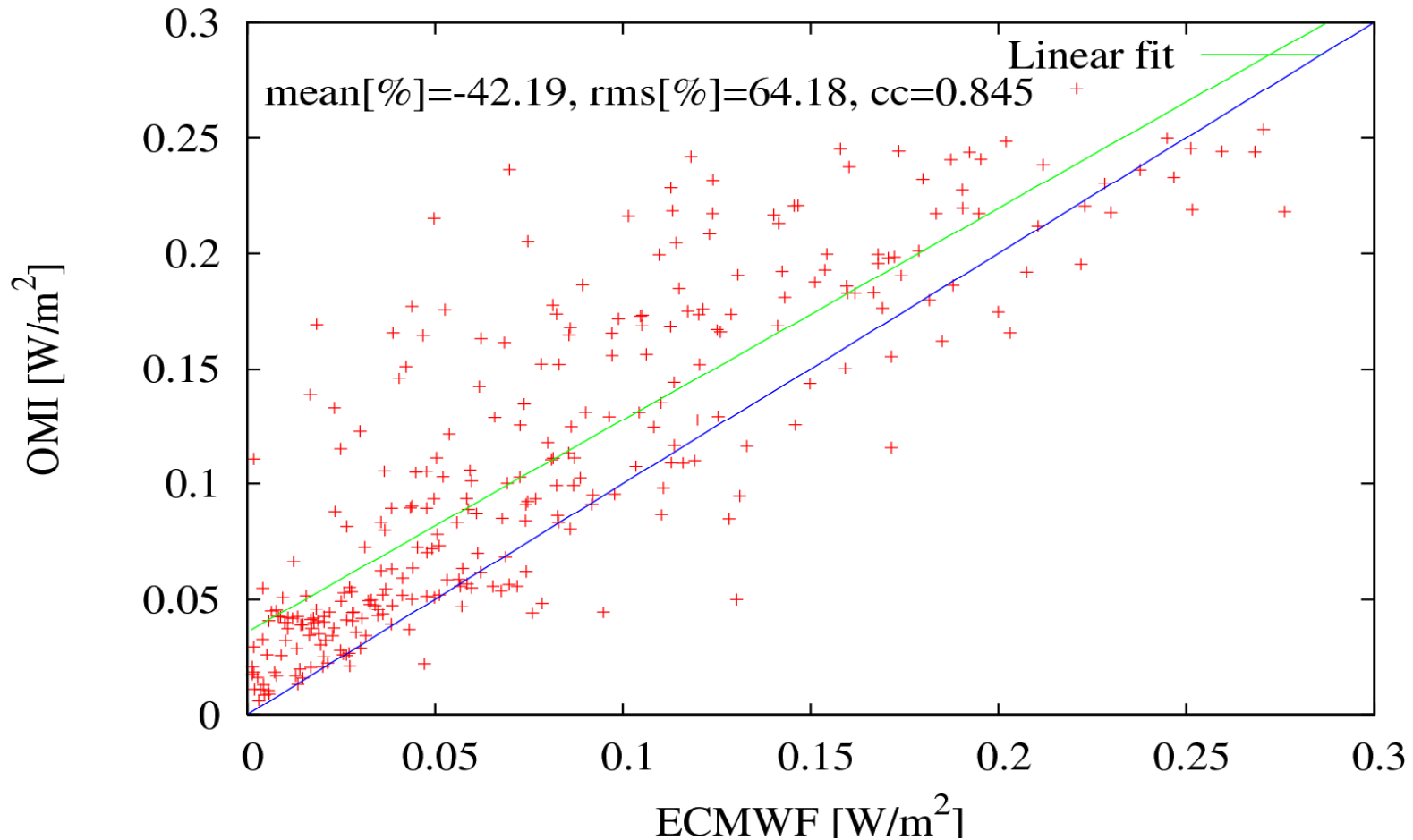
CIE Thessaloniki





Cloudy CIE at noon against OMI, 2005

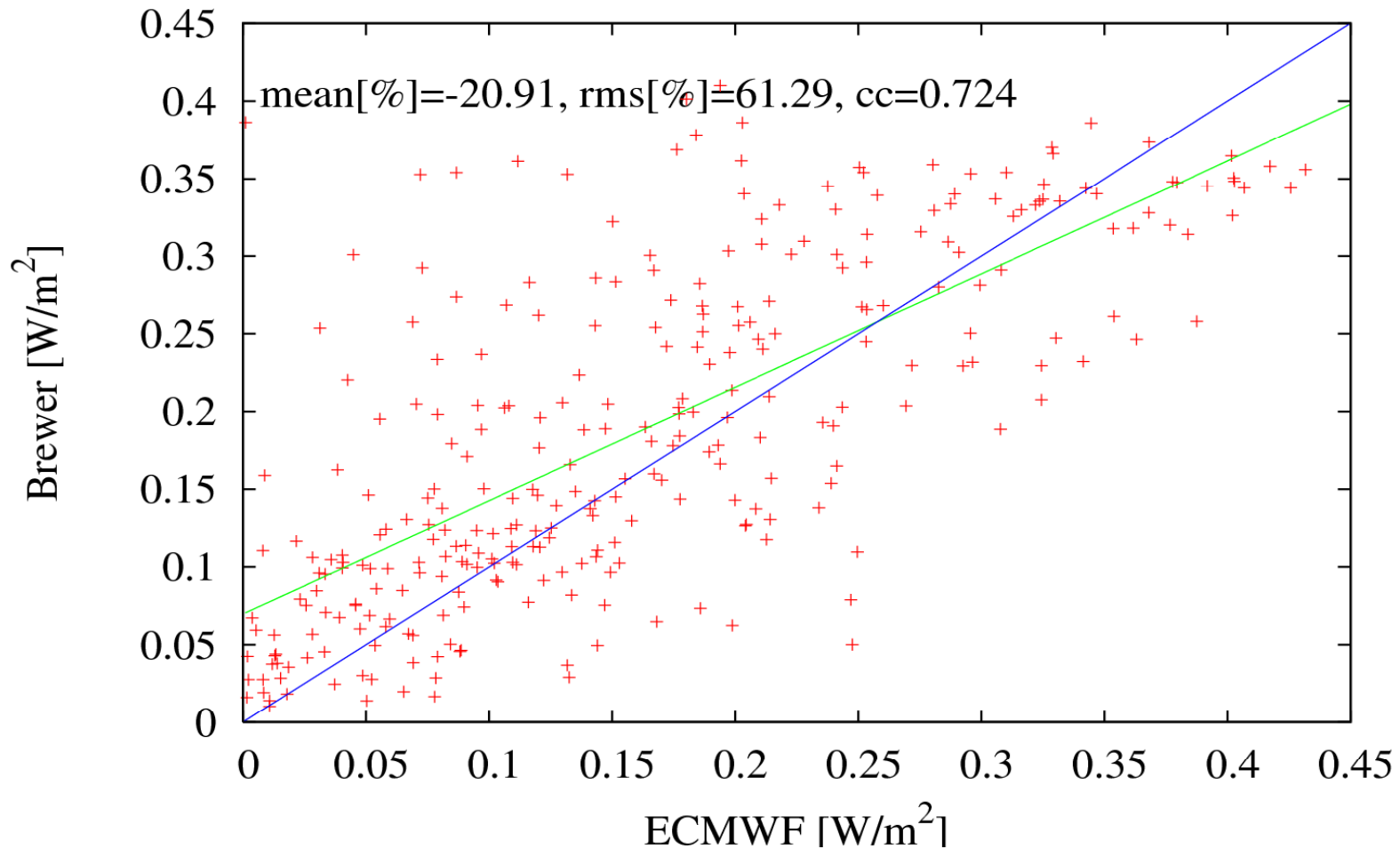
CIE Thessaloniki





320nm at noon against Brewer, 2005

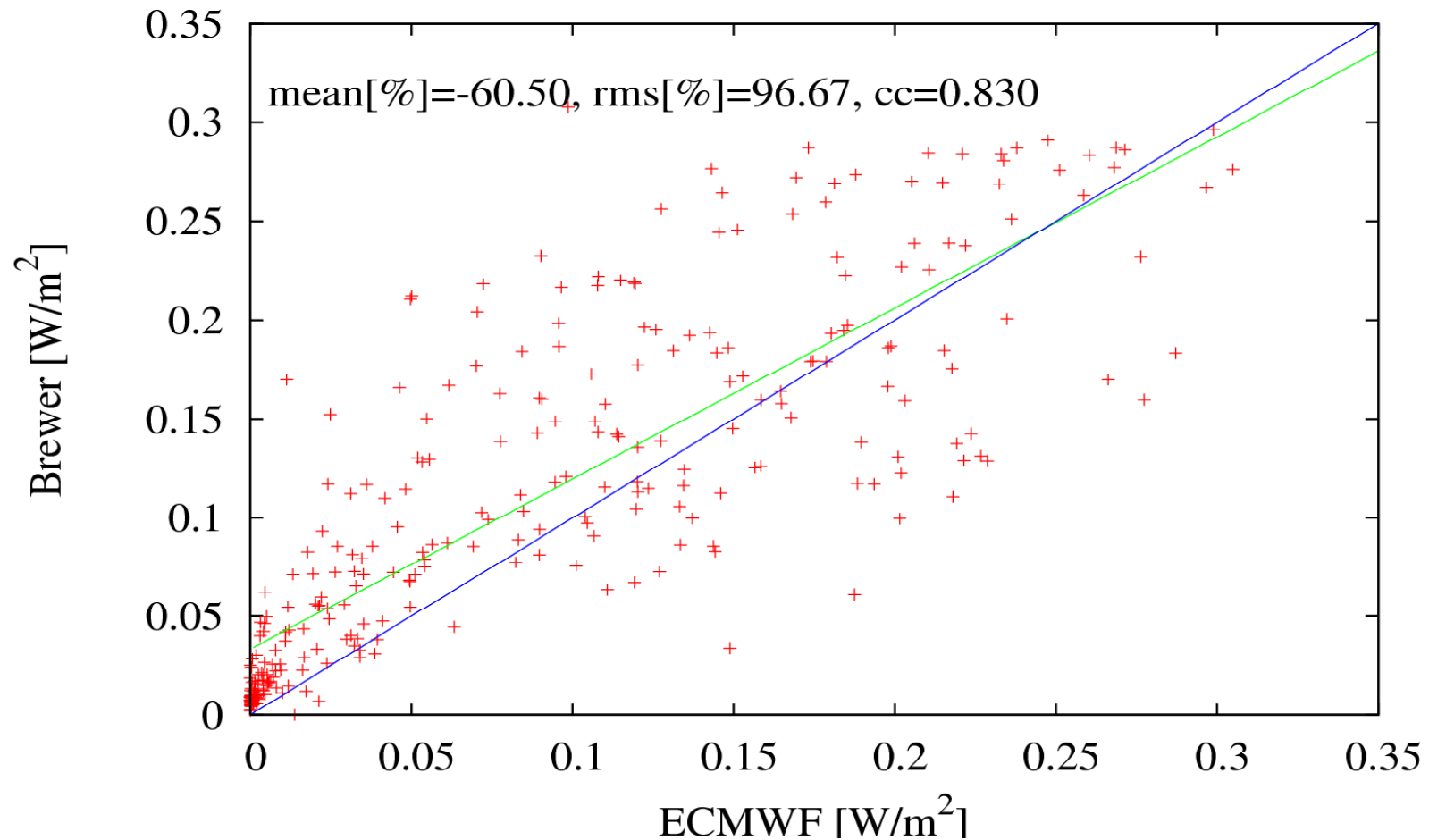
320nm Thessaloniki





320nm at noon against Brewer, 2005

320nm Jokioinen





Summary and Future Work

- A Processor to get UV-B and UV-A radiation products in/from the ECMWF IFS, has been developed within EU-project GEMS.
- The development work continues – focus on the improvement of aerosol treatment.
- More validation work will be also performed.

- Links for further details:

<http://www.ecmwf.publications/library/do/references/list/14>

<http://www.ecmwf.int/products/forecasts/d/inspect/catalog/research/gems/grg/uv/>



Acknowledgements

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