Auf dem Weg zu einem ICON-basierten Chemie-Klimamodell für AerChemMIP
CMIP6-CHEMIE-TP2

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Kickoff-Meeting BMBF project CMIP6 in Hamburg, 19. July 2016

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Outline

- The (ultimate) goal

- Status of the MESSy development

  -What HD(CP)^2 achieved already-

- Further steps

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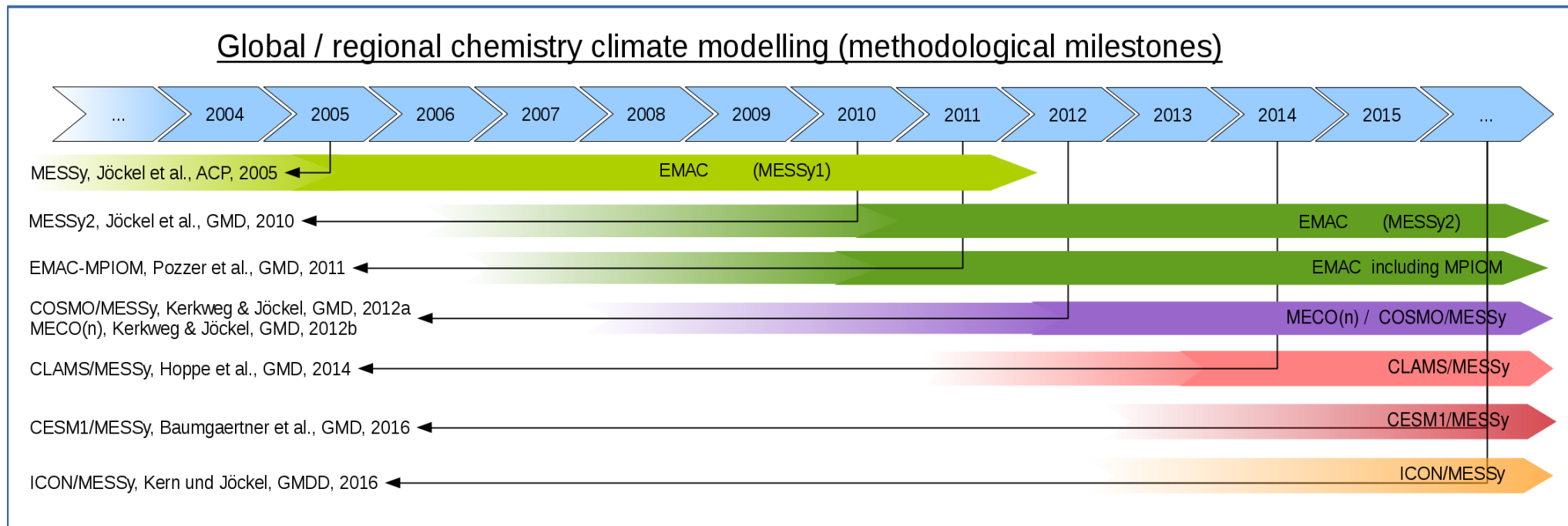Bonn

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The (ultimate) goal

- transfer (all) MESSy submodels used with EMAC in CMIP6 (and all meanwhile developed expansions) to the ICON model

  - achieving better scalability and run time behaviour on current and future HPC architectures

  - keep all the diagnostic possibilities developed for EMAC
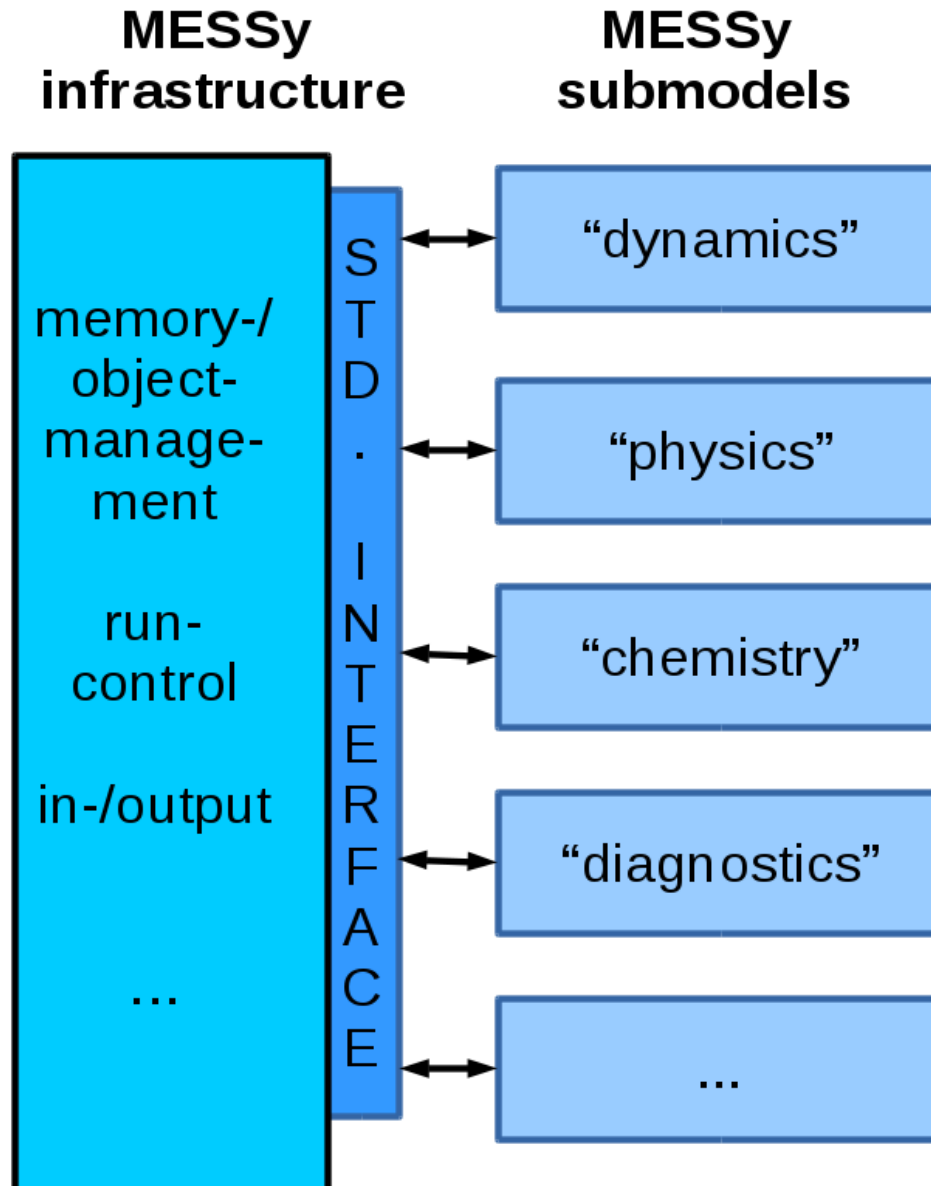
- … perform CMIP6 simulations for model evaluation …

... where we start from ...
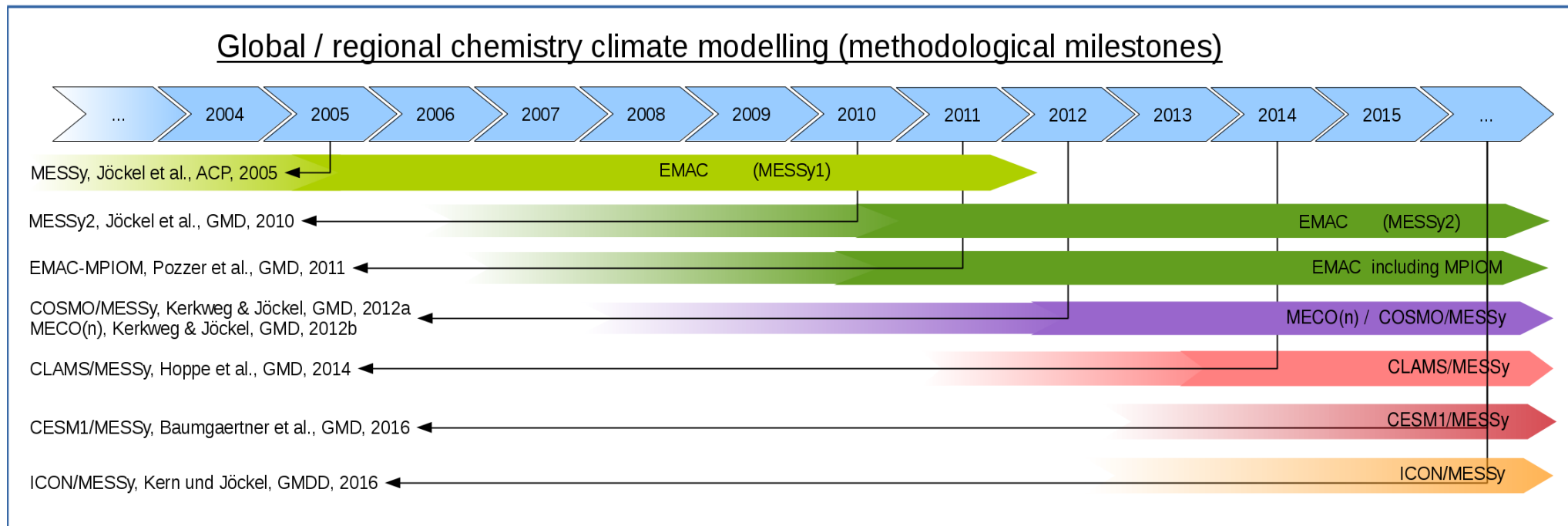
- MESSy interface is implemented in numerous base models

Global / regional chemistry climate modelling (methodological milestones)

... 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 ...

MESSy, Jöckel et al., ACP, 2005 — EMAC (MESSy1)

MESSy2, Jöckel et al., GMD, 2010 — EMAC (MESSy2)

EMAC-MPIOM, Pozzer et al., GMD, 2011 — EMAC including MPIOM

COSMO/MESSy, Kerkweg & Jöckel, GMD, 2012a
MECO(n), Kerkweg & Jöckel, GMD, 2012b — MECO(n) / COSMO/MESSy

CLAMS/MESSy, Hoppe et al., GMD, 2014 — CLAMS/MESSy

CESM1/MESSy, Baumgaertner et al., GMD, 2016 — CESM1/MESSy

ICON/MESSy, Kern und Jöckel, GMDD, 2016 — ICON/MESSy

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The structure of MESSy

... where we start from ...

- MESSy interface is implemented in numerous base models

Global / regional chemistry climate modelling (methodological milestones)

| ... | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | ... |

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... where we start from ...

- MESSy interface is implemented in numerous base models

- Large parts of MESSy infrastructure have been implemented in ICON

  HD(CP)^2 project S1-WP1 (Bastian Kern, DLR)

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HD(CP)² - Model Diagnostics (subproject)

- HD(CP)² Phase I milestones:
  - Diagnostic Interface in ICON
  - Prototype implementation of advanced diagnostic tool

- Implementation in ICON:
  - Modular Earth Submodel System (MESSy)
  - #ifdef MESSY …
  - Extensions to CHANNEL, TIMER, Infrastructure (multi-domain support)
- Prototype advanced diagnostic tools
  - "Aggregation on user defined regular grids" (GRAGG== Grid AGGregation)
  - VIsual Satellite OPerator (VISOP) (developed at LMU)

Performance test on "Mistral"

ICON, 3-domains, std. ICON output,
15 min. diagnostic submodel output
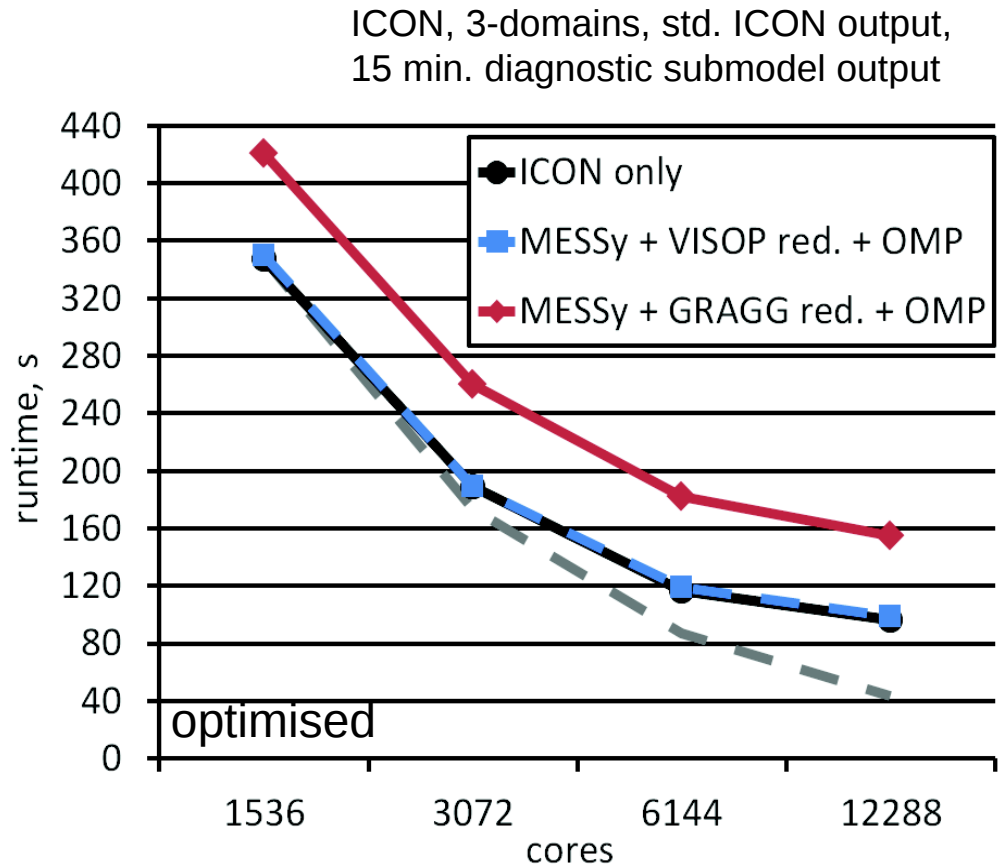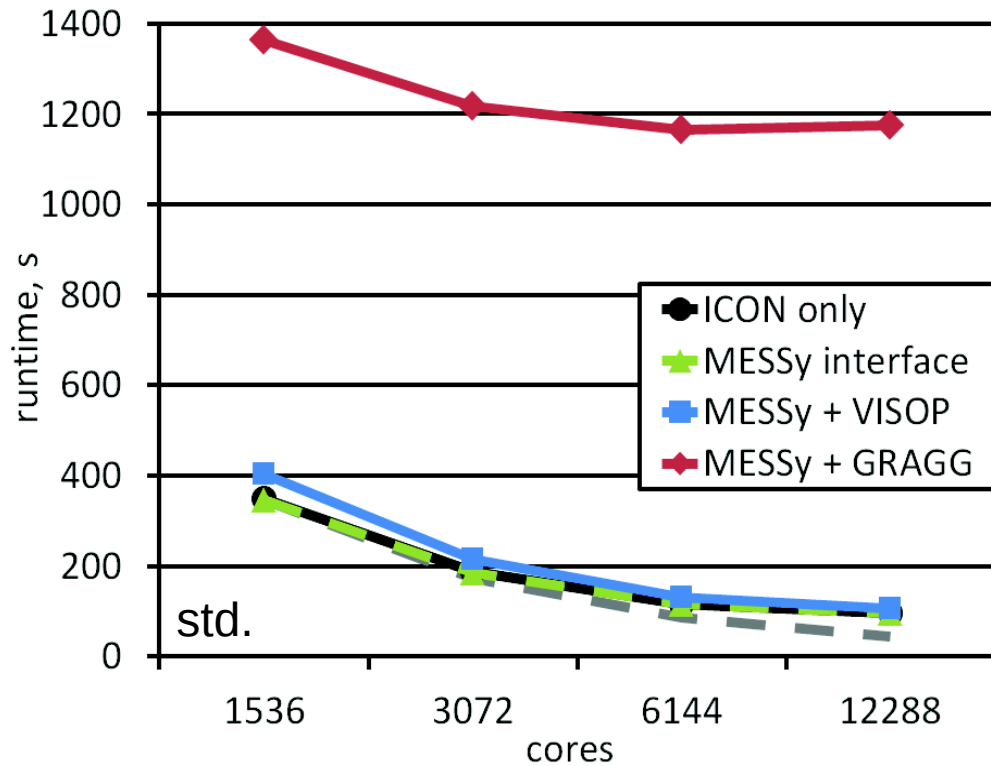
- Diagnostic Interface: no overhead

- VISOP (optimised): max. +2.72%   (column based)

- GRAGG (optimised): max. +60.79%   (high MPI communication)

Kern & Jöckel, GMDD

Bastian Kern, DLR

Steps to ICON/MESSy (I)

1) Implement remaining infrastructure submodels:
   IMPORT, TRACER

2) Implement consecutively process submodels
   required for gas phase chemistry simulations

3) evaluation of gas phase chemistry

4) …

5) … go further to full complexity

Steps to ICON/MESSy (II)

1) Implement Community Land Model (CLM) via MESSy interface in COSMO model

2) Evaluation of COSMO/MESSy including CLM

3) improve vertical tracer transport in boundary layer

4) test MESSy submodel CLM in ICON

5) Contribute to ICON LAM version for COSMO-CLM-Community

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Steps to ICON/MESSy (III)
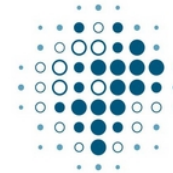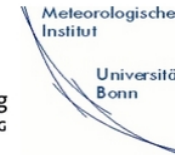
Support of MESSy Community

- code version maintenance

- meeting organisation

- web site

- …