
**Mathematical Modelling, Simulation and Optimization for Societal Challenges with Scientific Computing**

# OPM in MSO4SC

Atgeirr Flø Rasmussen, SINTEF
Budapest workshop, May 23 2017

# Outline

- Who
- Why
- What
- How

# Who

- Open Porous Media software components are or have been developed by:
  - Companies (Statoil, Total)
  - Research institutes (SINTEF, IRIS, TNO)
  - Universities (U. Stuttgart, NTNU)
  - Consultants
- Financing from industry and public (RCN, EU)
- Open source allows easier collaboration!

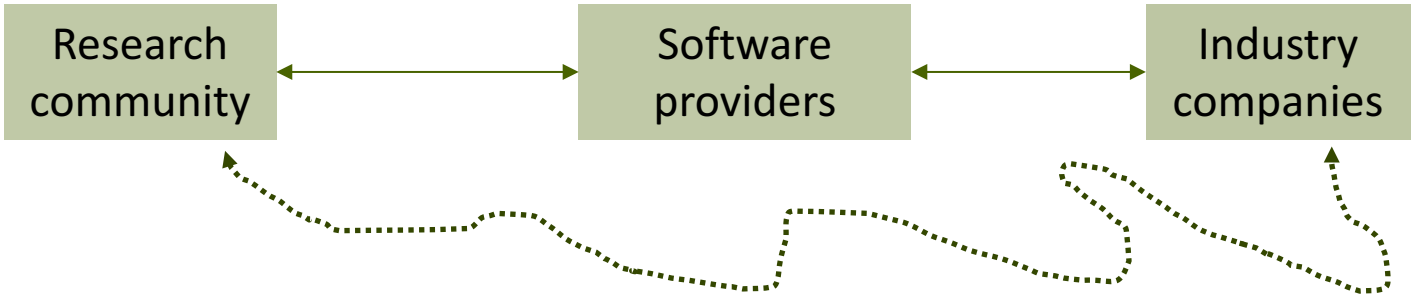
# Why OPM

- Started in 2009 to combine:
  - Grids and discretizations (SINTEF)
  - Advanced fluid models (U. Stuttgart)
  - Industrial know-how and funding (Statoil)

- Vision: A long-lasting, efficient, and well-maintained, open-source software for flow and transport in porous media.

- Ambition: to be a strong base for both industrial development and academic research

From this:



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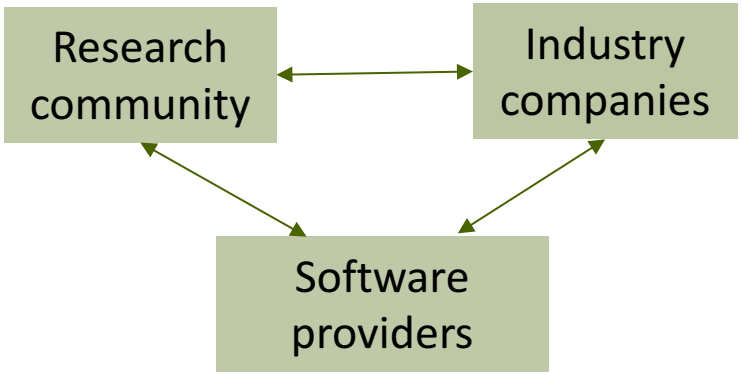


# Why MSO4SC

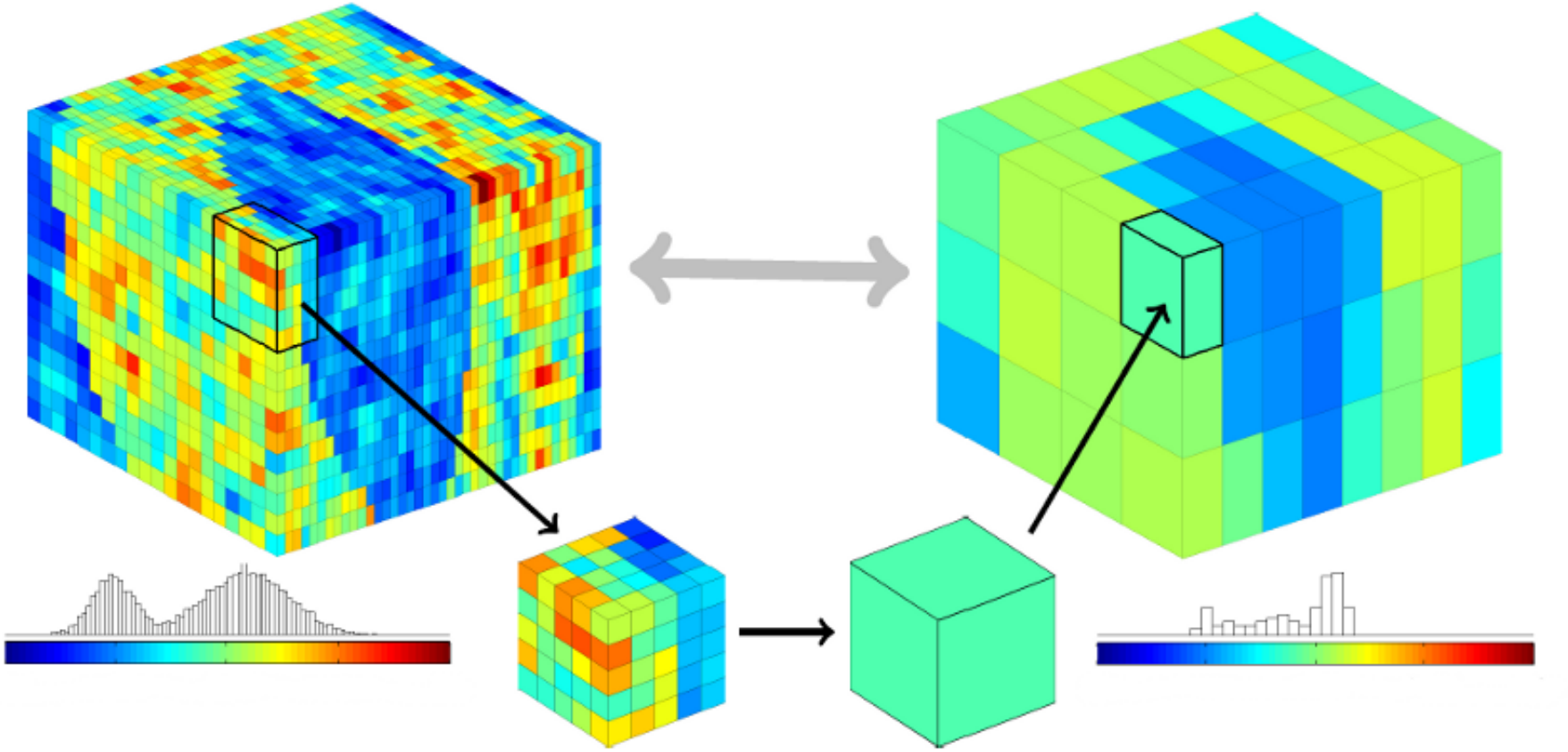
- Take OPM to where usage is going to be
  - Cloud, ensembles, larger scales
- Improved visibility and dissemination
  - Get more users
  - Get more feedback
  - Get more contributors
  - Gain new clients for our services
- Improve OPM software
  - Deployability
  - Usability
  - Scalability

# What

- OPM Software (C++):
  - Reservoir simulator: **Flow**
  - Visualization tool for reservoir data: **ResInsight**
  - **Upscaling** tools for physical properties, flow diagnostics tools
  - “Toolbox” with components for a wide range of porous media flow simulation
- Open data
  - Full real field case: **Norne**
  - Benchmark cases from SPE comparative solutions project
  - Testing datasets for OPM software

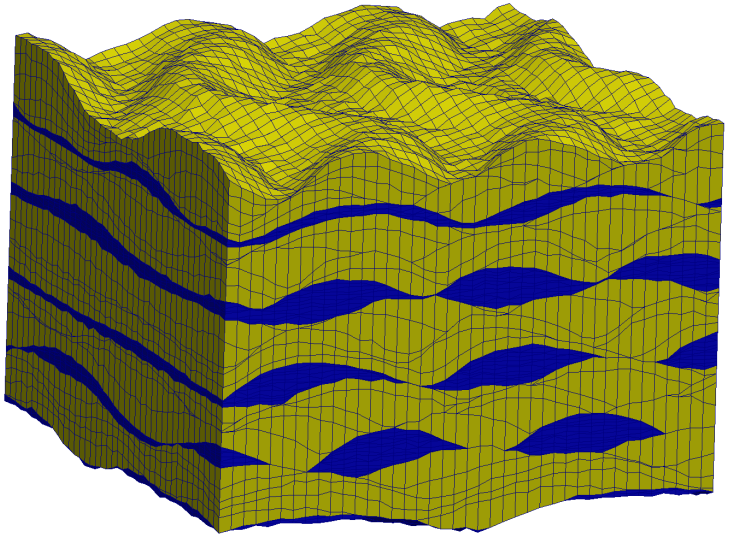
# Upscaling (I)

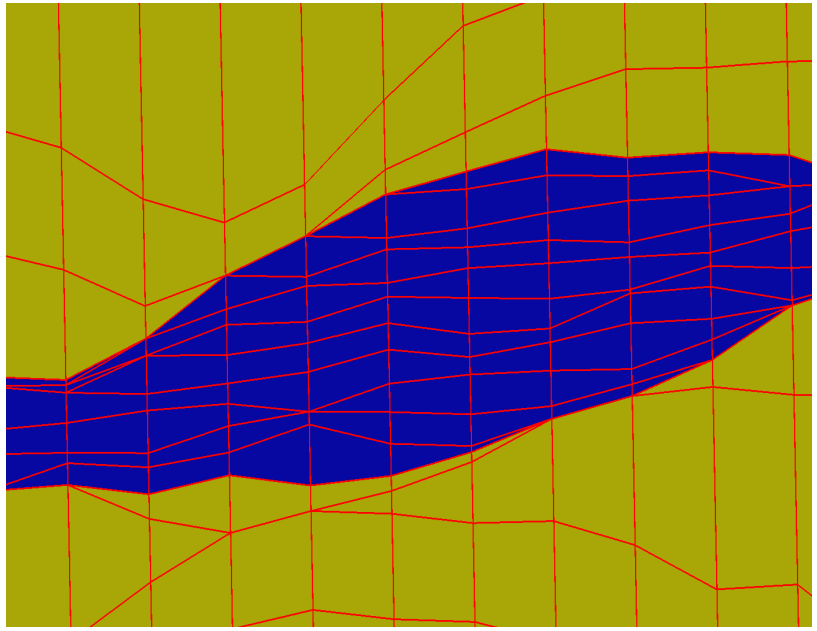
- Finding effective coarse-scale properties



# Upscaling (II)

- Typical grids for upscaling domains

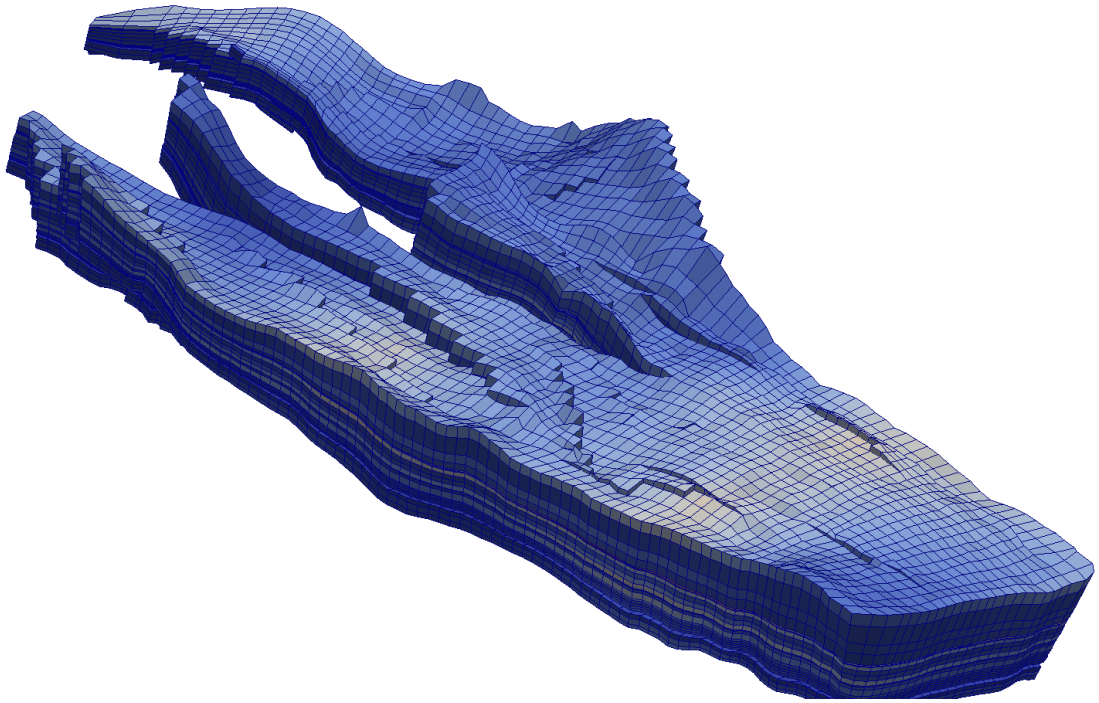




- Simple averaging insufficient
  - Must do flow-based upscaling

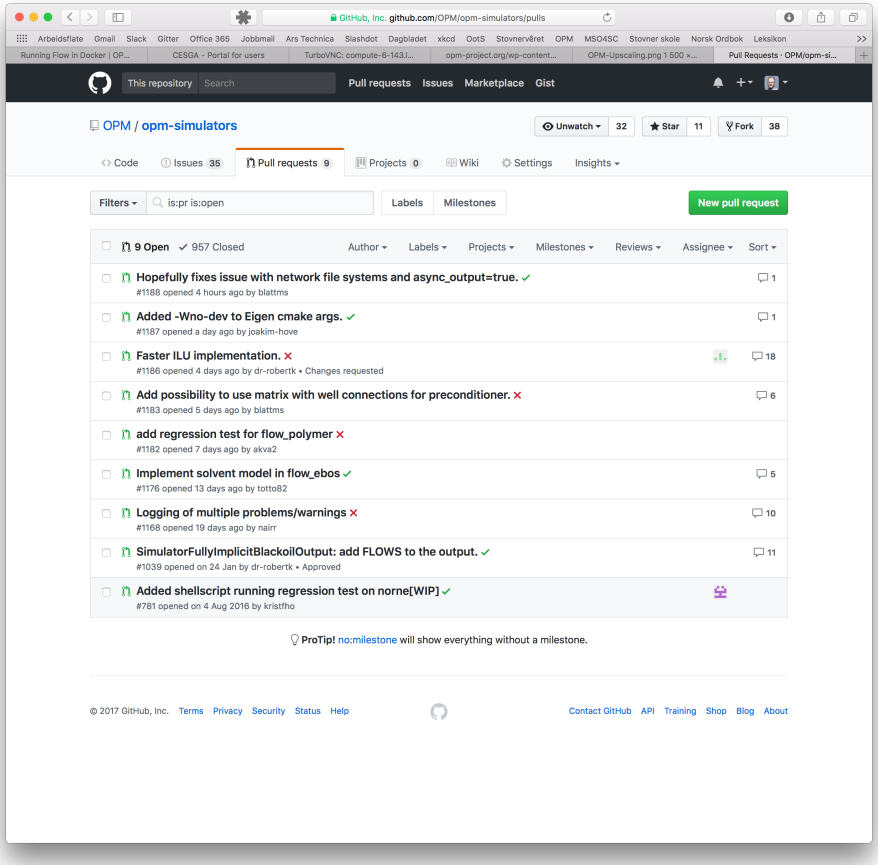
# The Norne data set

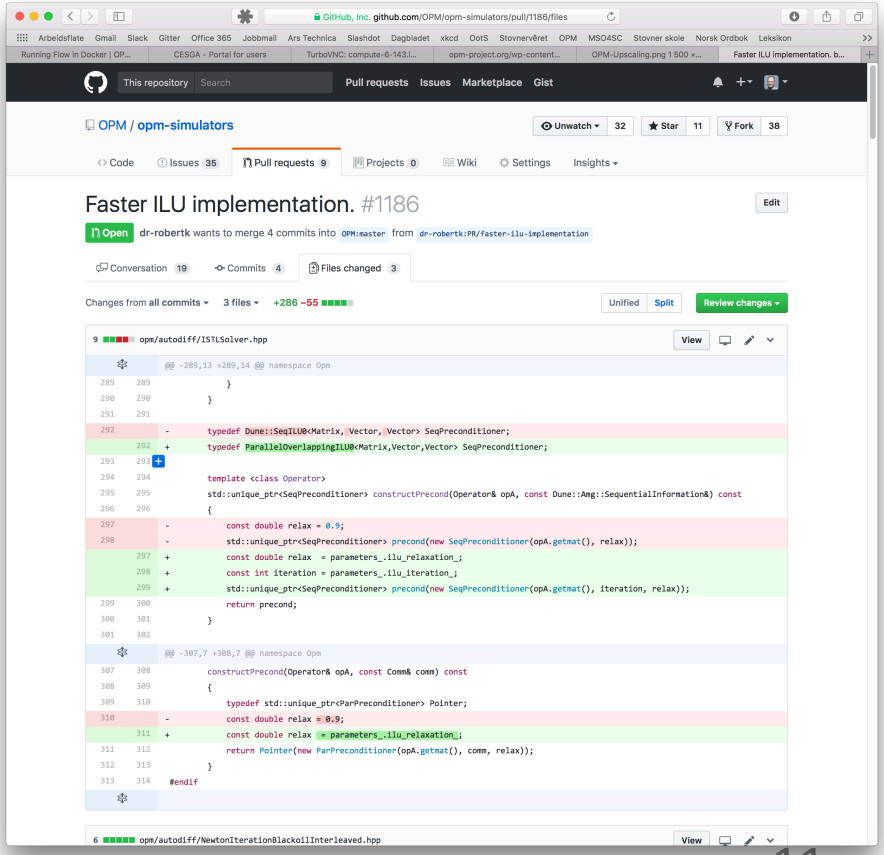
- Only publicly available real oilfield data set
- Norwegian Sea oilfield, operated by Statoil
- Includes historical production rates and measurements
- Not very large (45000 cells), but has interesting features:
  - Faults, heterogeneity, anisotropy, ill-shaped cells, horizontal wells



# How (I)

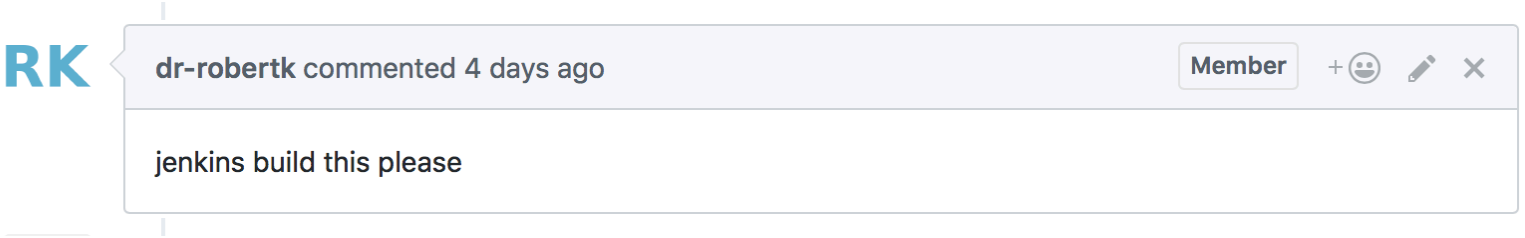
- Development open on GitHub, using pull request approach



# How (II)

- Continuous integration: Jenkins




- Regular releases: 2017.04 current, 2017.10 next
- Almost-weekly hangouts (Sintef, IRIS, Statoil, others)
  - Make everyone work towards same goal
  - Forum for technical discussions and decisions
  - Essential to coordinate fixes and improvements, avoiding duplicated efforts
- Communication: website, mailinglist, GitHub issues

# *Thank you for your attention!*

**Contact information:**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|---|---|
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| Project Coordinator: | Javi Nieto (ATOS) javi.nieto@atos.net |
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**Mathematical Modelling, Simulation and Optimization for Societal Challenges with Scientific Computing**


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Atos

Research Center MATHEON
Mathematics for Key Technologies

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