

The PRISM Software Infrastructure:

Achievements and Next Steps

Outline

- Introduction: Background and Drivers
- PRISM Software Infrastructure
 - Requirements & Ideas
 - Overview
 - Availability
- Future Work

Introduction: Background

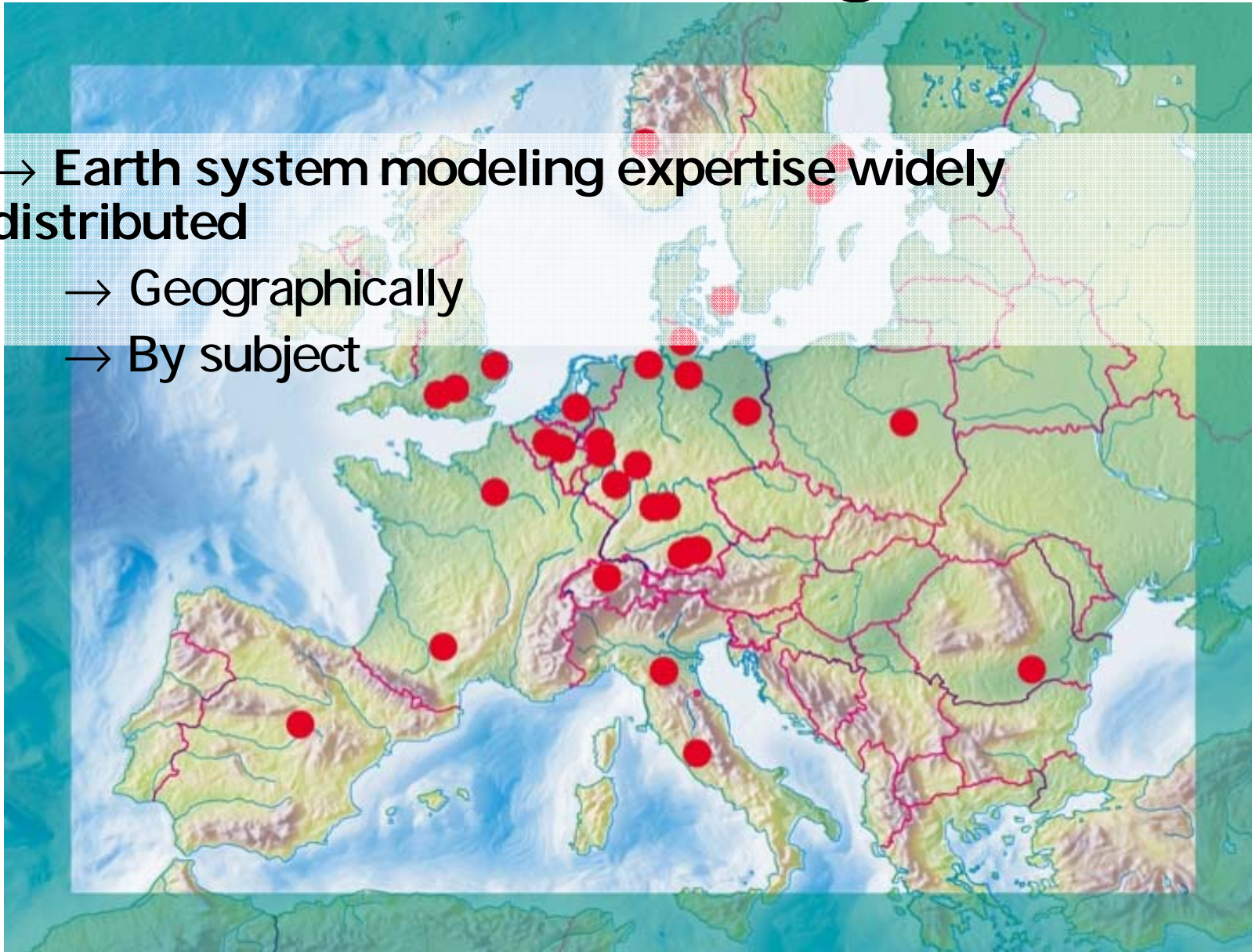


Introduction: Background

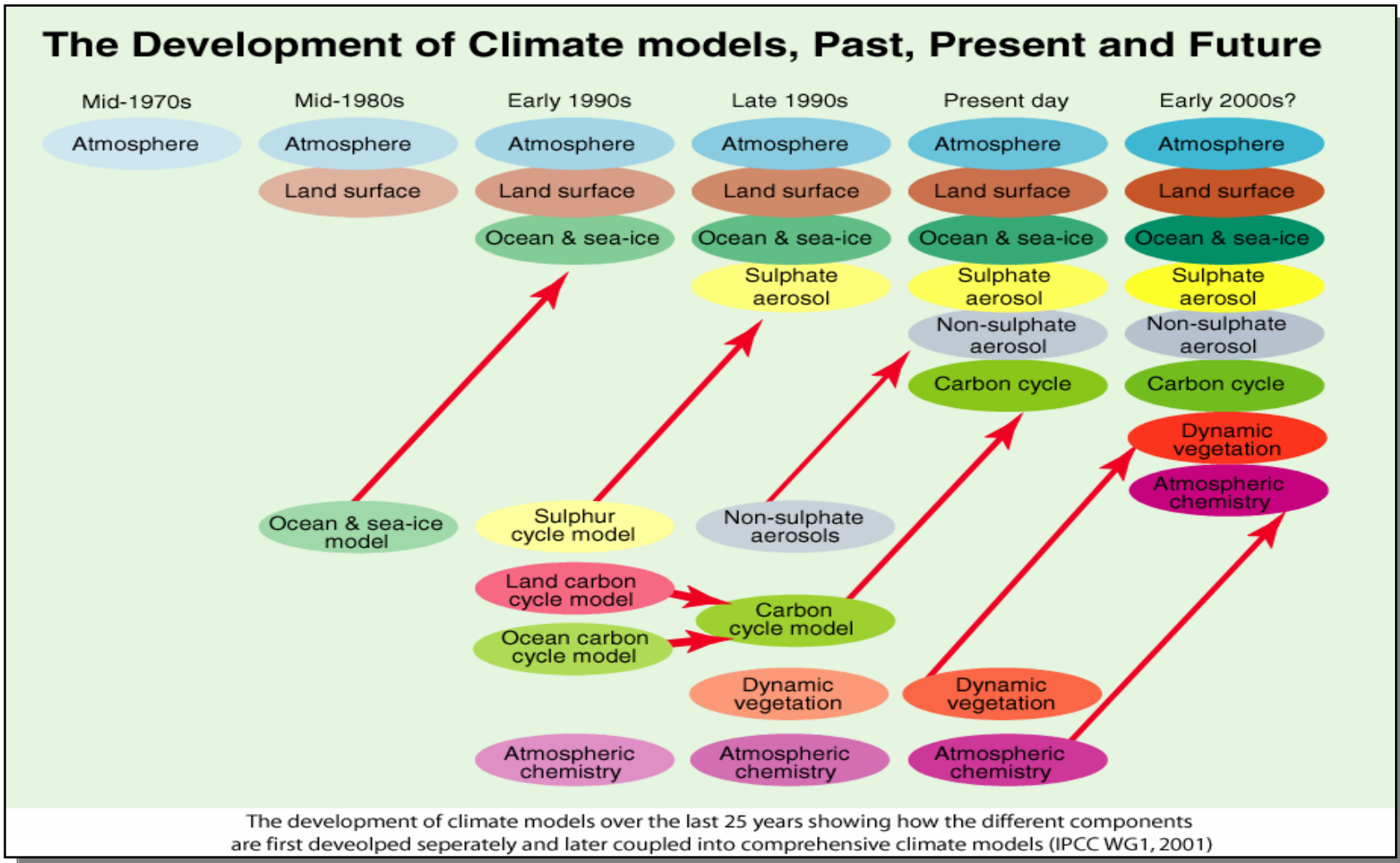
→ Earth system modeling expertise widely distributed

→ Geographically

→ By subject



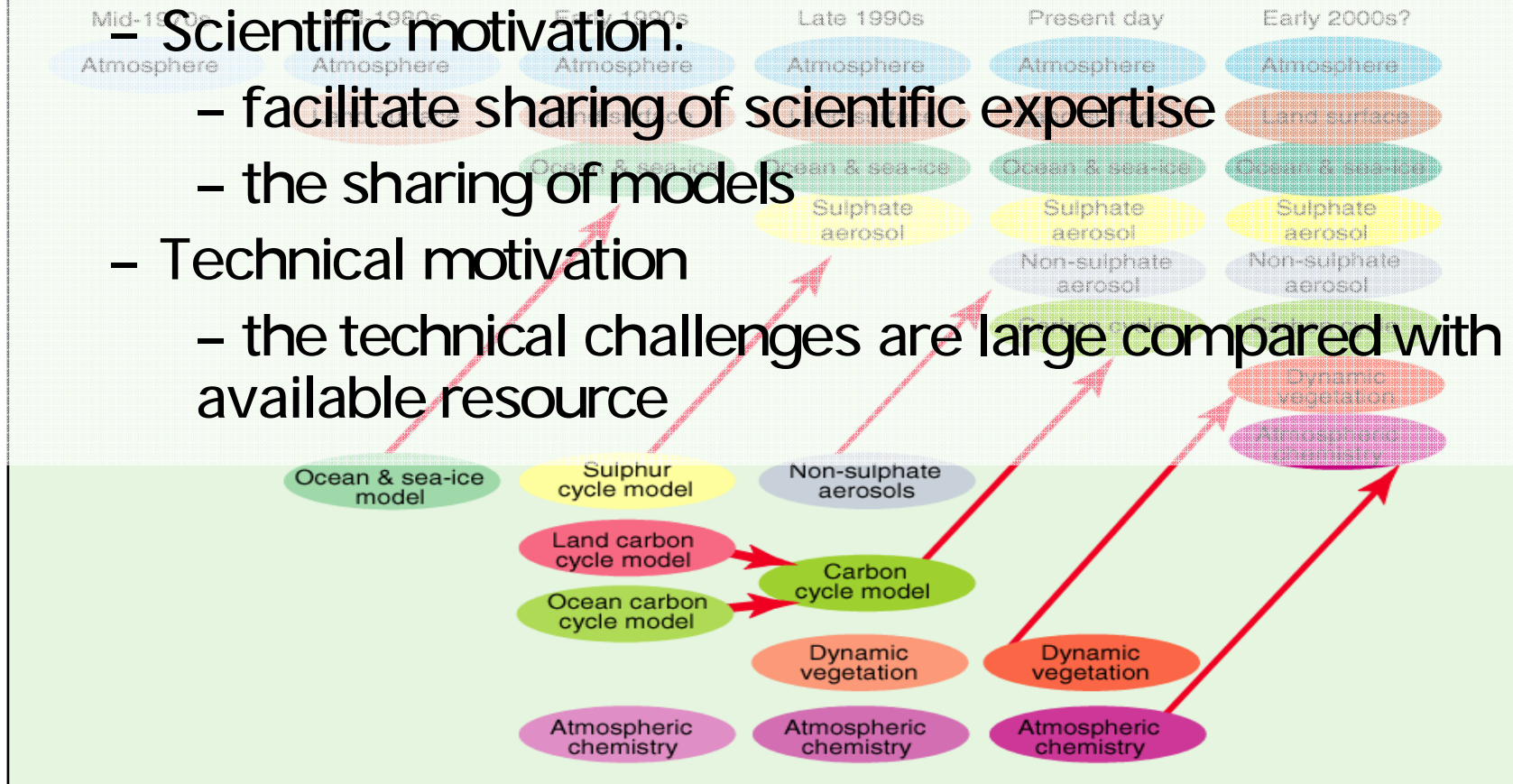
Introduction: Background



Introduction: Background

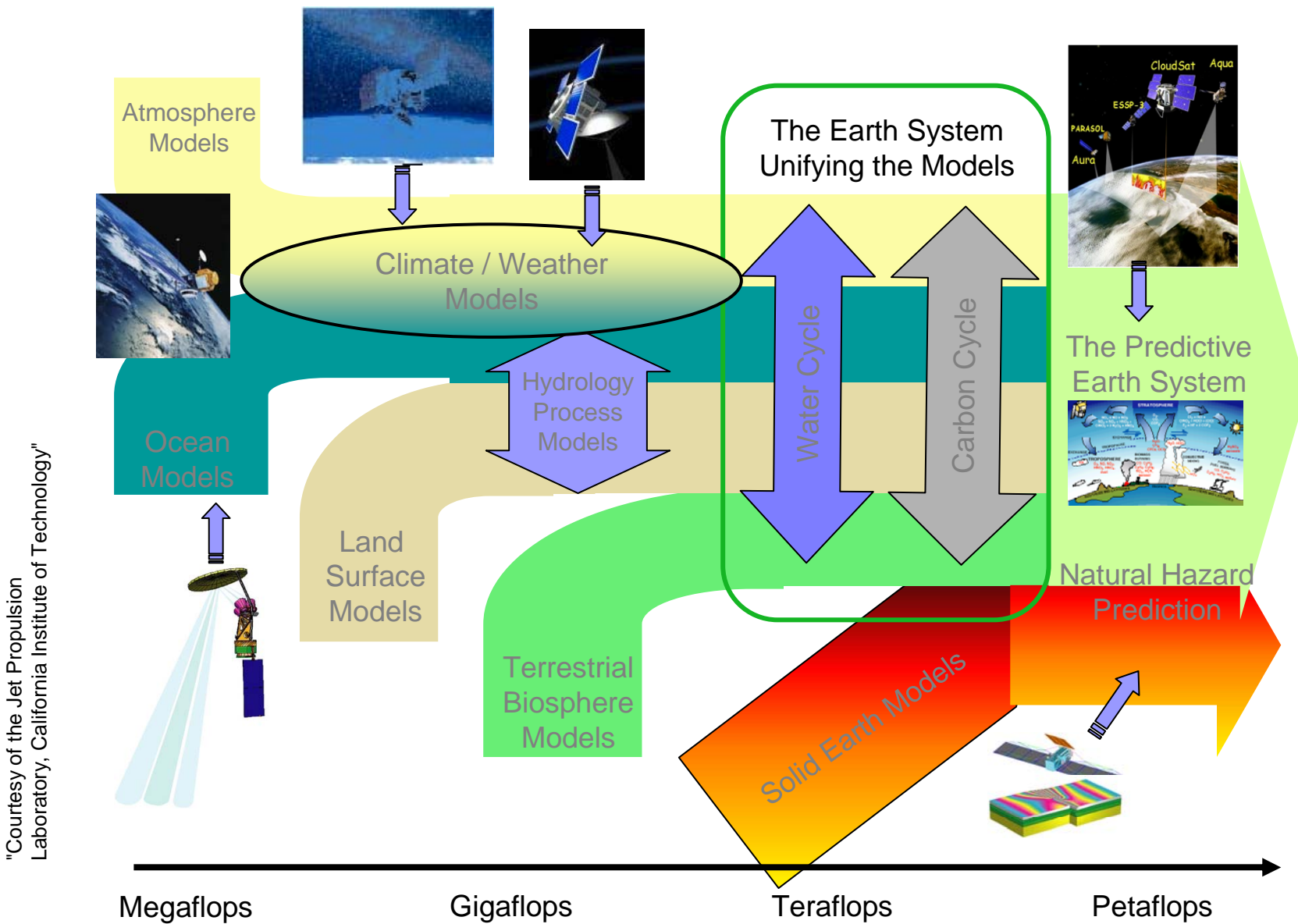
Earth system modeling expertise widely distributed

- Scientific motivation:
 - facilitate sharing of scientific expertise
 - the sharing of models
- Technical motivation
 - the technical challenges are large compared with available resource



The development of climate models over the last 25 years showing how the different components are first developed separately and later coupled into comprehensive climate models (IPCC WG1, 2001)

Introduction: Background



Introduction: Background

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The Earth System
Unifying the Models

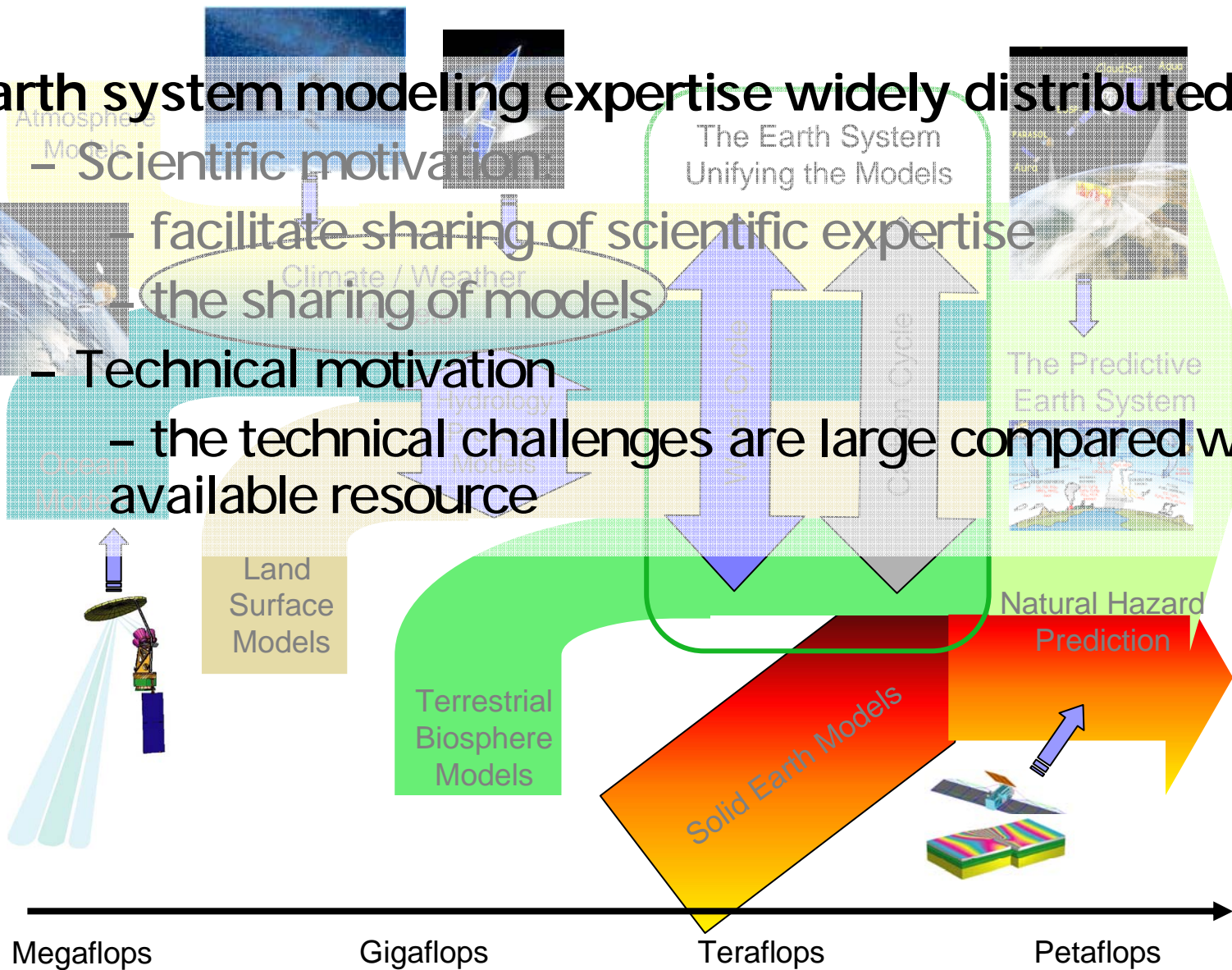
The Predictive
Earth System

Natural Hazard
Prediction

Land
Surface
Models

Terrestrial
Biosphere
Models

Solid Earth Models



"Courtesy of the Jet Propulsion
Laboratory, California Institute of Technology"

Introduction: Background

Earth system modeling expertise widely distributed

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– facilitate sharing of scientific expertise

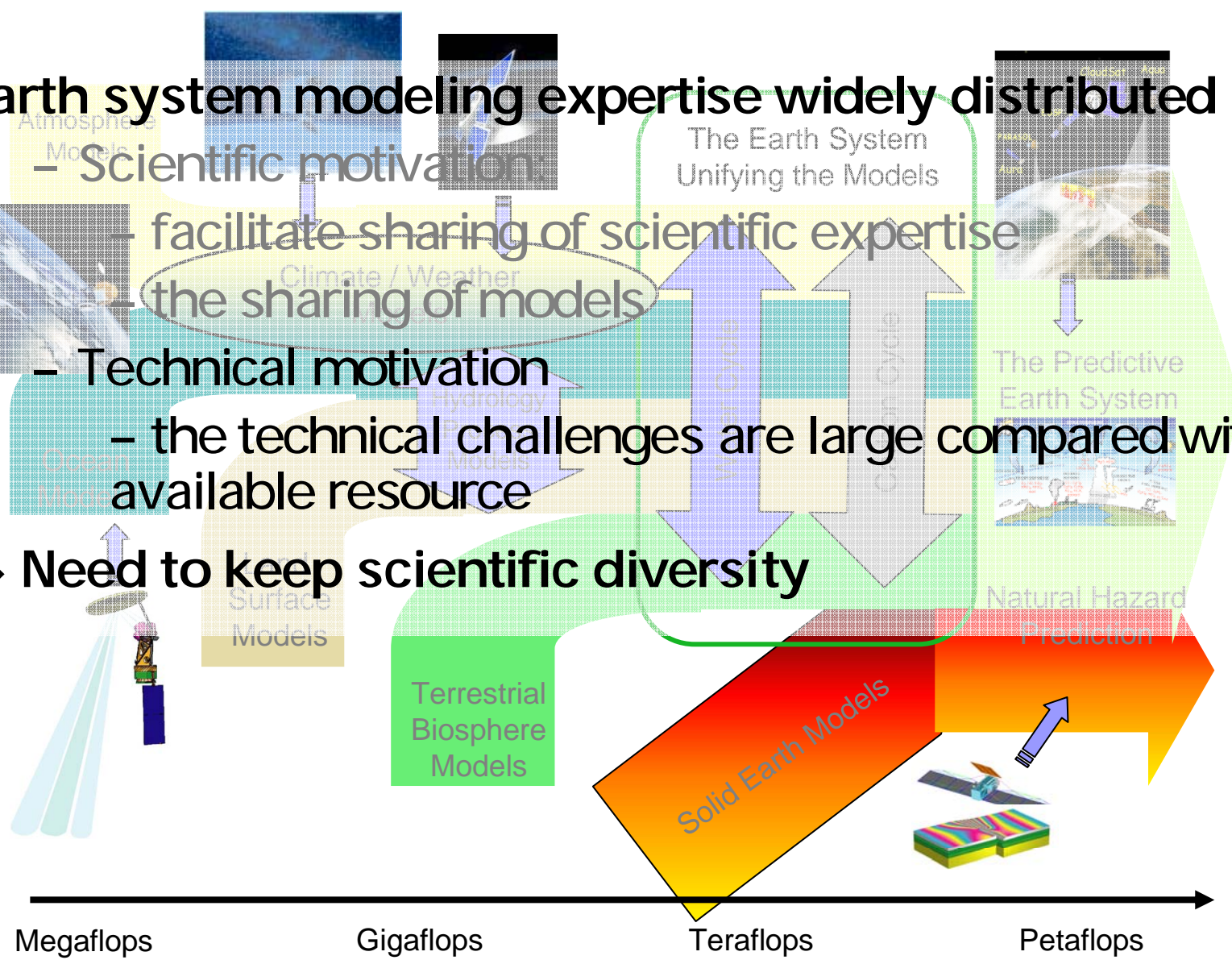
– the sharing of models

– Technical motivation

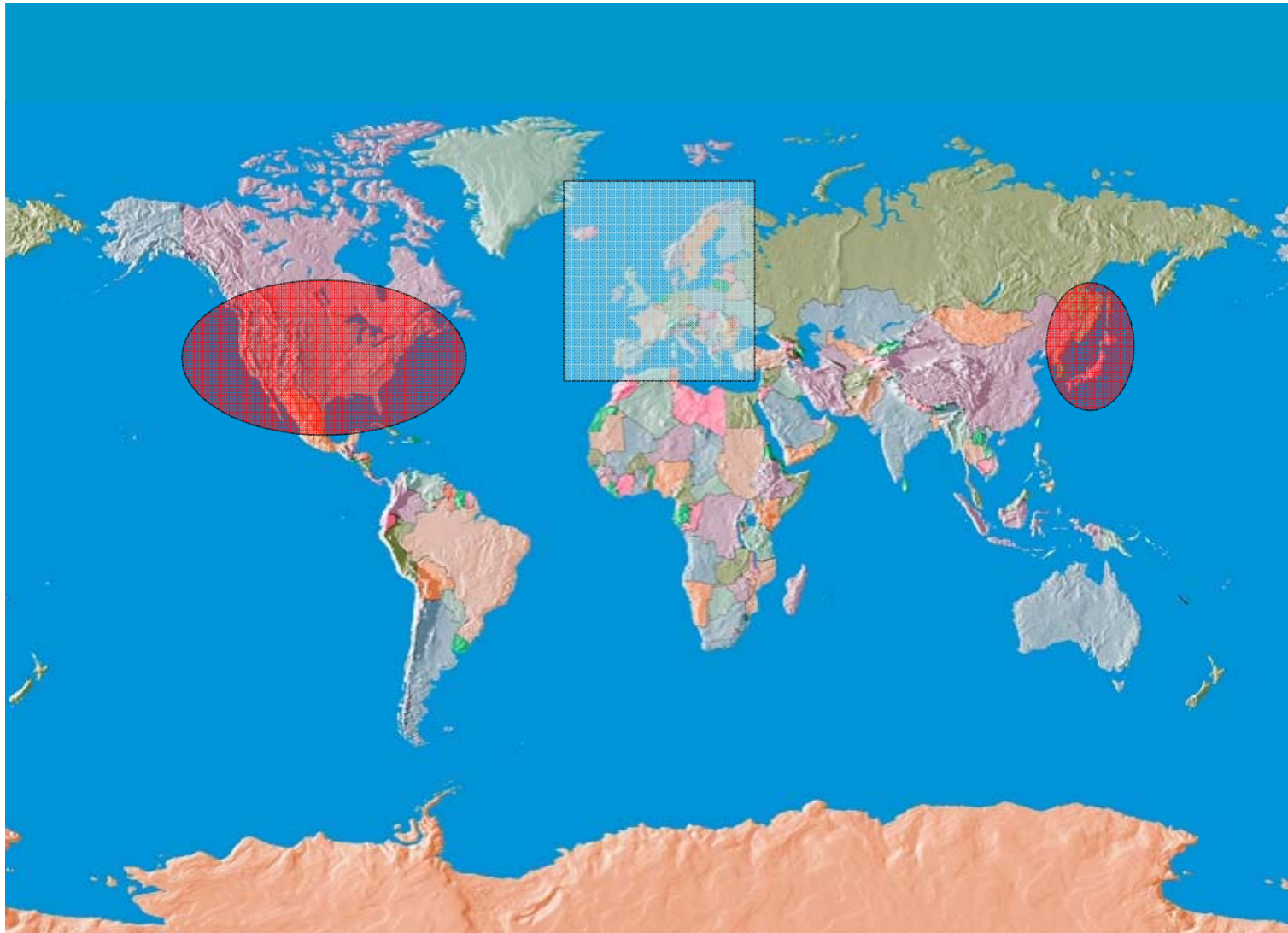
– the technical challenges are large compared with available resource

→ Need to keep scientific diversity

"Courtesy of the Jet Propulsion Laboratory, California Institute of Technology"



Introduction: ... and Drivers



Introduction: ... and Drivers

Earth system modeling expertise widely distributed

- Scientific motivation:

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→ **Need to keep scientific diversity**

→ **At the same time increase efficiency**

- Scientific

- Technical

PRISM: Requirements & Ideas

- Program for integrated Earth System Modelling
 - 22 partners
 - 3 Years, from Dec 2001 - Nov 2004
 - 5 Mill. funding, FP5 of the EC
 - Coordinators: G.Brasseur and G.Komen

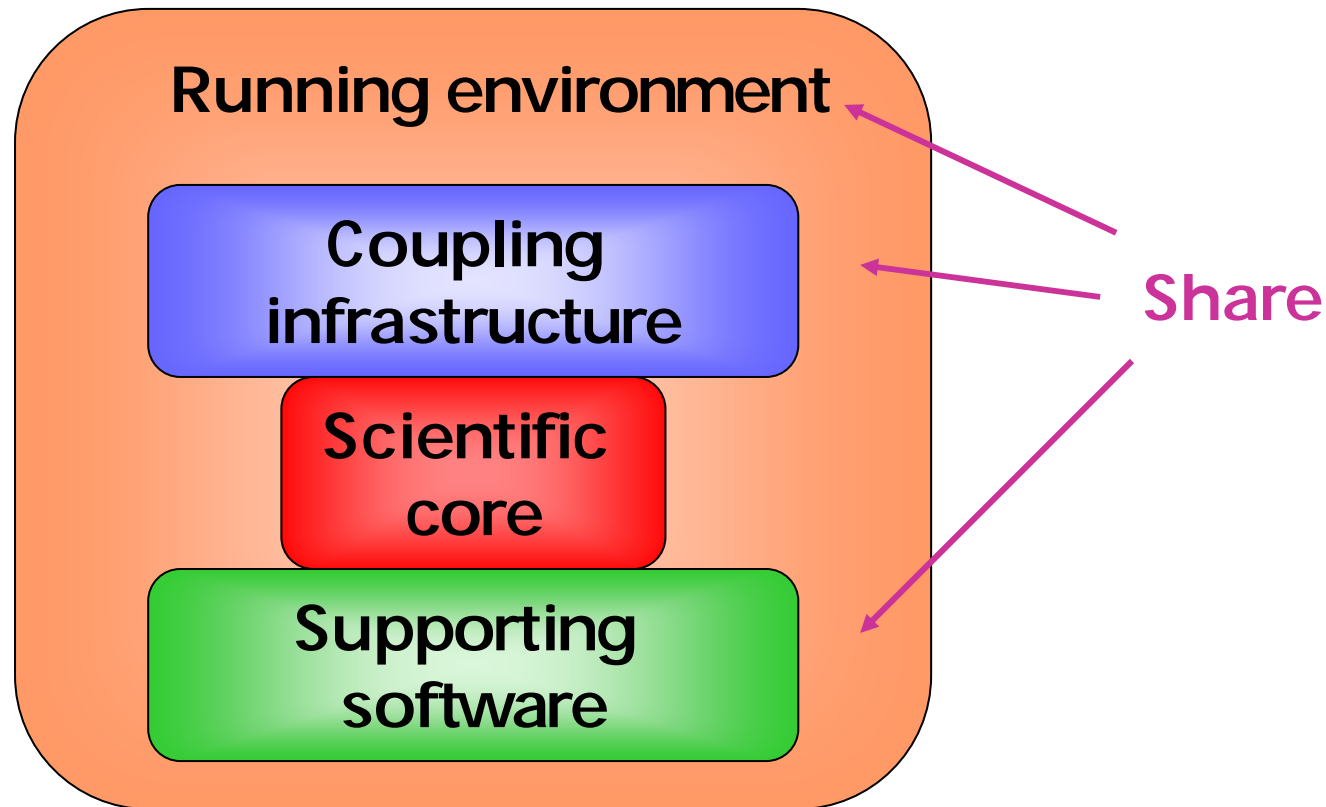
To make life of
Earth System Modellers easier

PRISM: Requirements & Ideas

« Share Earth System Modelling
software infrastructure
across community »

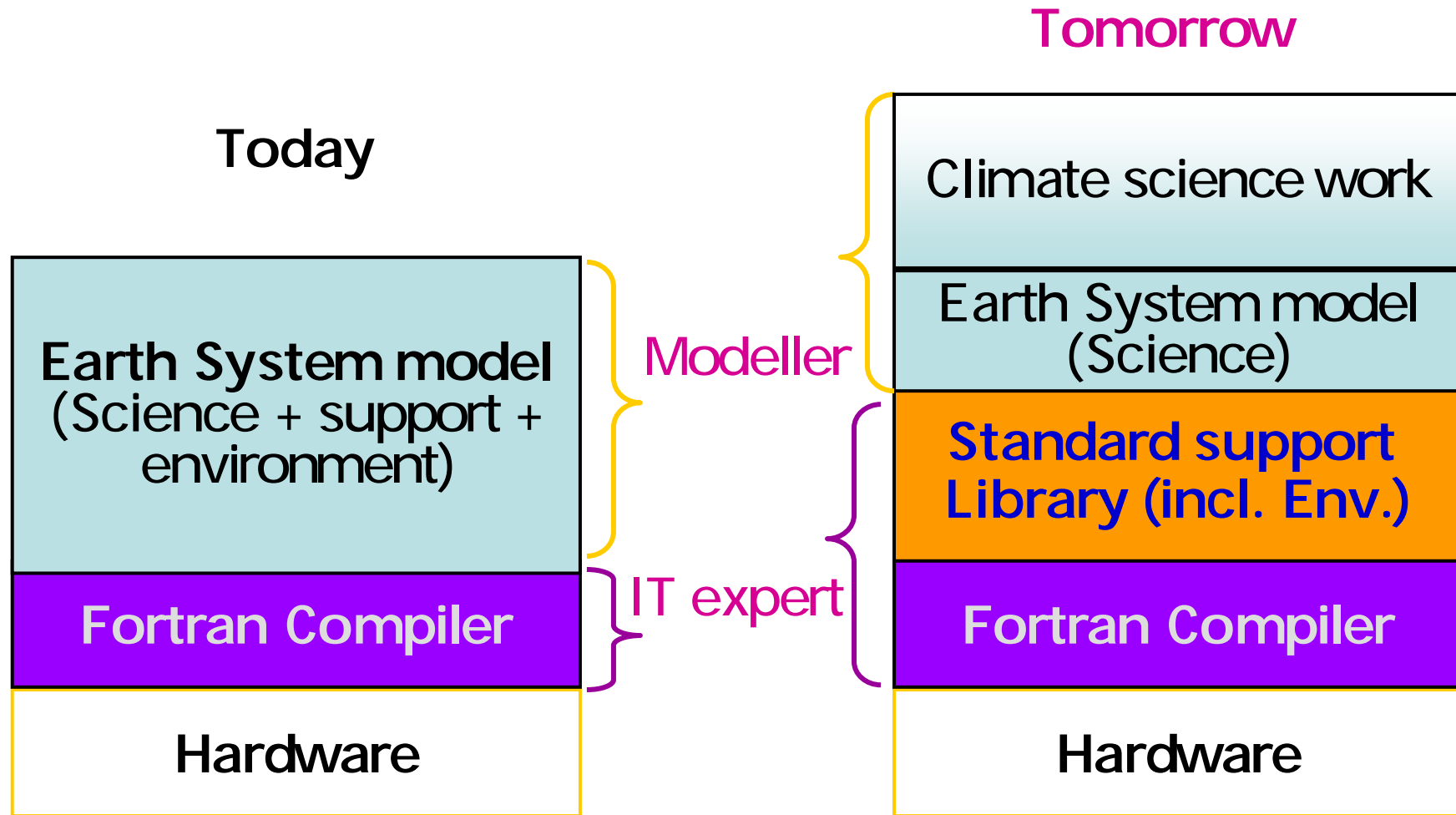
- **Methods:**
 - Share development, maintenance and support
 - Gain performance, coop with manufacturers
 - Standardize modeling software environment
 - Alleviate use of different climate component models

Software structure of an Earth System Model



PRISM: The long term view

Towards standard ESM support library(ies)



PRISM: The People

Reinhard Budich - MPI, Hamburg
Andrea Carril - INGV, Bologna
Mick Carter - Hadley Center, Exeter
Patrice Constanza - MPI/M&D, Hamburg
Jérôme Cuny - UCL, Louvain-la-Neuve
Damien Declat - CERFACS, Toulouse
Ralf Döscher - SMHI, Stockholm
Thierry Fichet - UCL, Louvain-la-Neuve
Marie-Alice Foujols - IPSL, Paris
Veronika Gayler - MPI/M&D, Hamburg

Eric Guilyardi - CGAM, Reading and LSCE
Roselyn Hatcher - Hadley Center, Exeter
Miles Kastowsky - MPI/BCG, Iena
Luis Kornbluh - MPI, Hamburg
Claes Larsson - ECMWF, Reading
Stefanie Legutke - MPI/M&D, Hamburg
Corinne Le Quéré - MPI/BCG, Iena
Angelo Mangili - CSCS, Zurich
Anne de Montety - UCL, Louvain-la-Neuve
Serge Planton - Météo-France, Toulouse
Jan Polcher - LMD/IPSL, Paris
René Redler, NEC CCRLE, Sankt Augustin
Martin Stendel - DMI, Copenhagen
Sophie Valcke - CERFACS, Toulouse
Peter van Velthoven - KNMI, De Bilt
Reiner Vogelsang - SGI, Grasbrunn
Nils Wedi - ECMWF, Reading

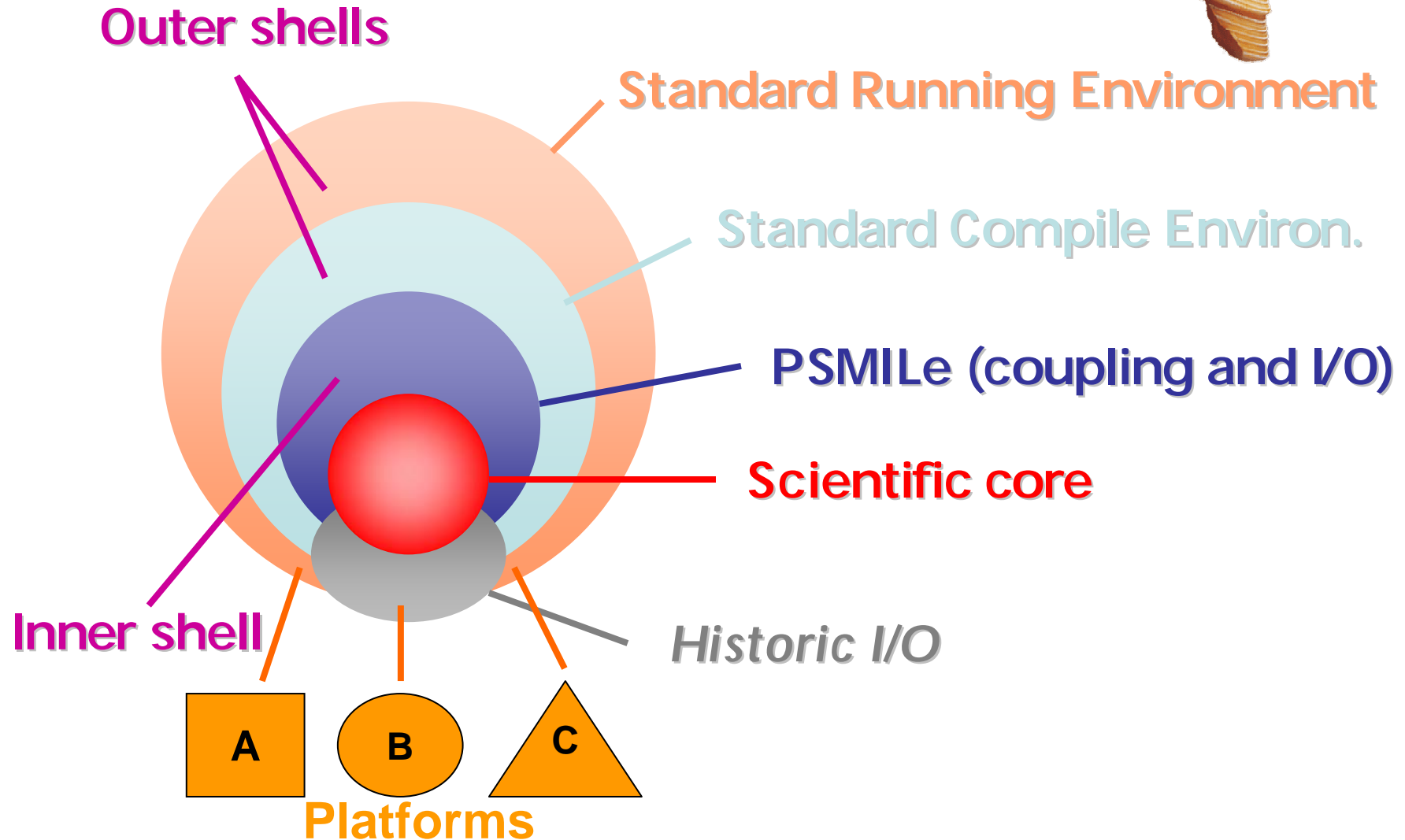
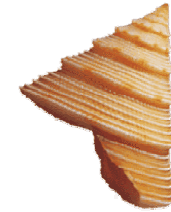


PRISM: An Overview

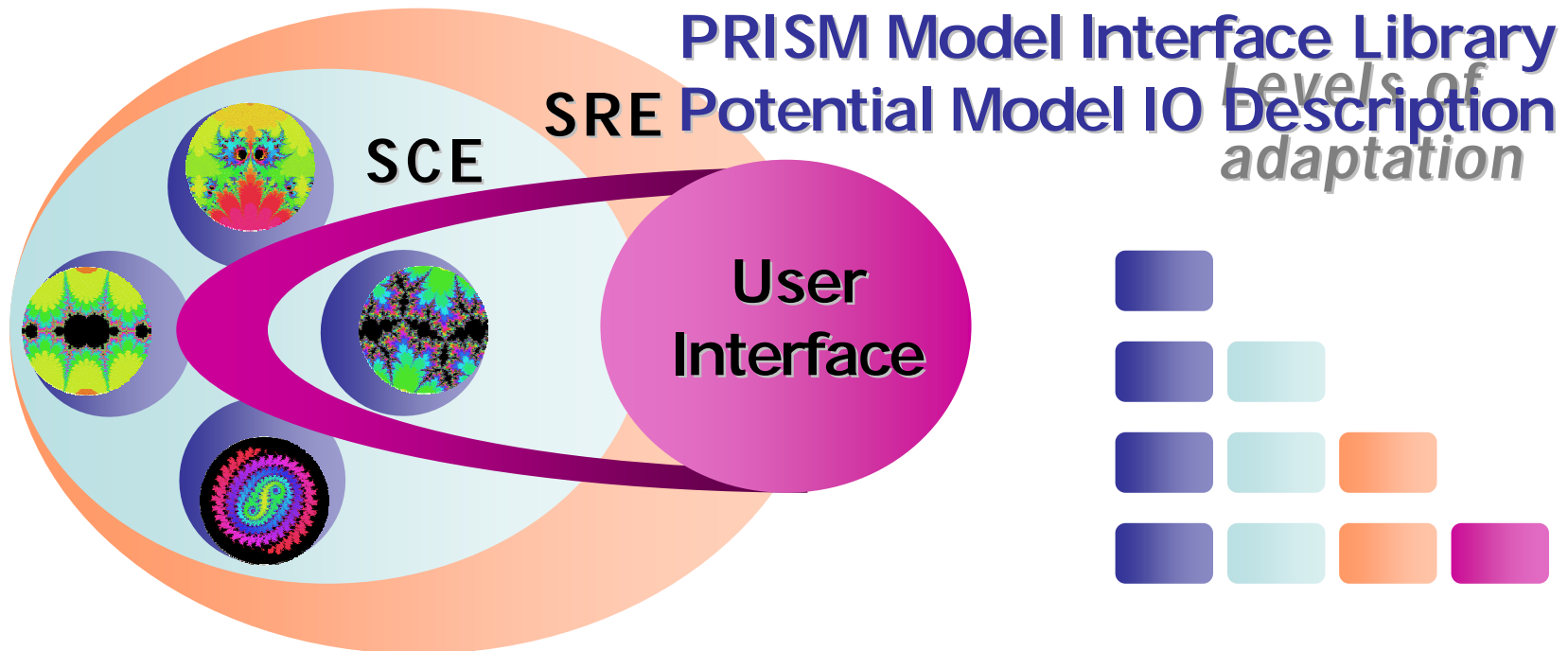
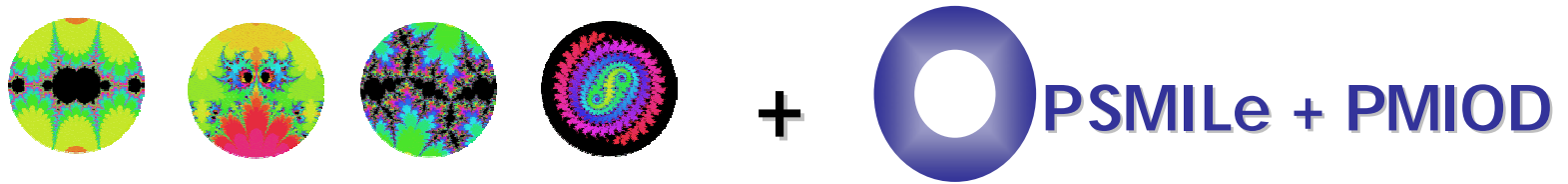
Expected Benefits:

- Easier to assemble ESMs based on community models
 - High performance ESM software
 - Developed by dedicated IT experts
 - Available to institutes/teams at low cost
 - To help scientists to focus on science
 - To help keep scientific diversity
 - ⇒ Higher scientific output
 - ⇒ Survival of smaller groups
- Increased scientific exchanges through shared infrastructure
- Computer manufacturers help to
 - Gain efficiency (porting, optimization) on their platforms
 - Next generation platforms influenced by ESM needs
 - Easier procurements and benchmarking
 - Reduced computing costs

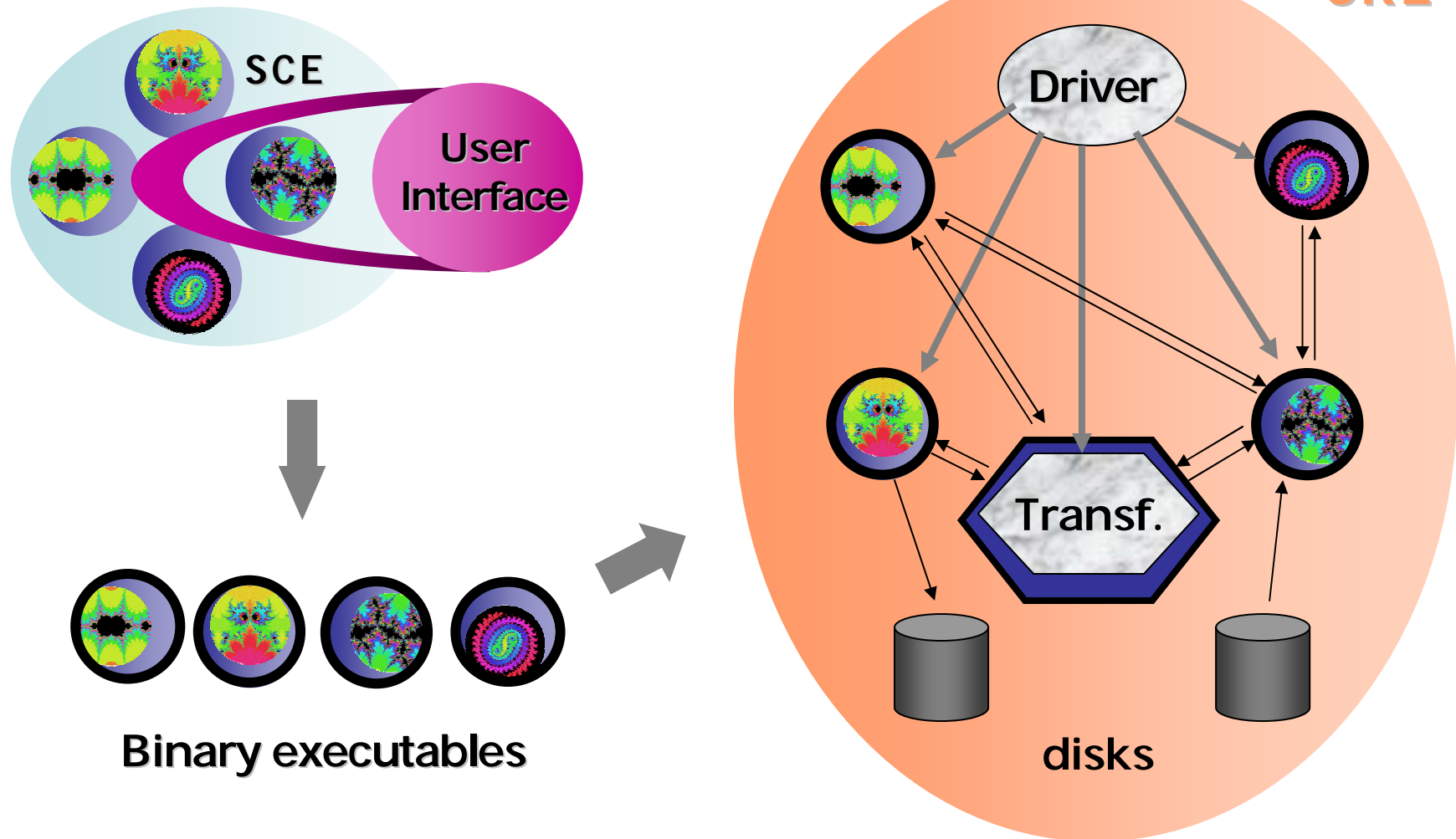
PRISM: Framework Shells



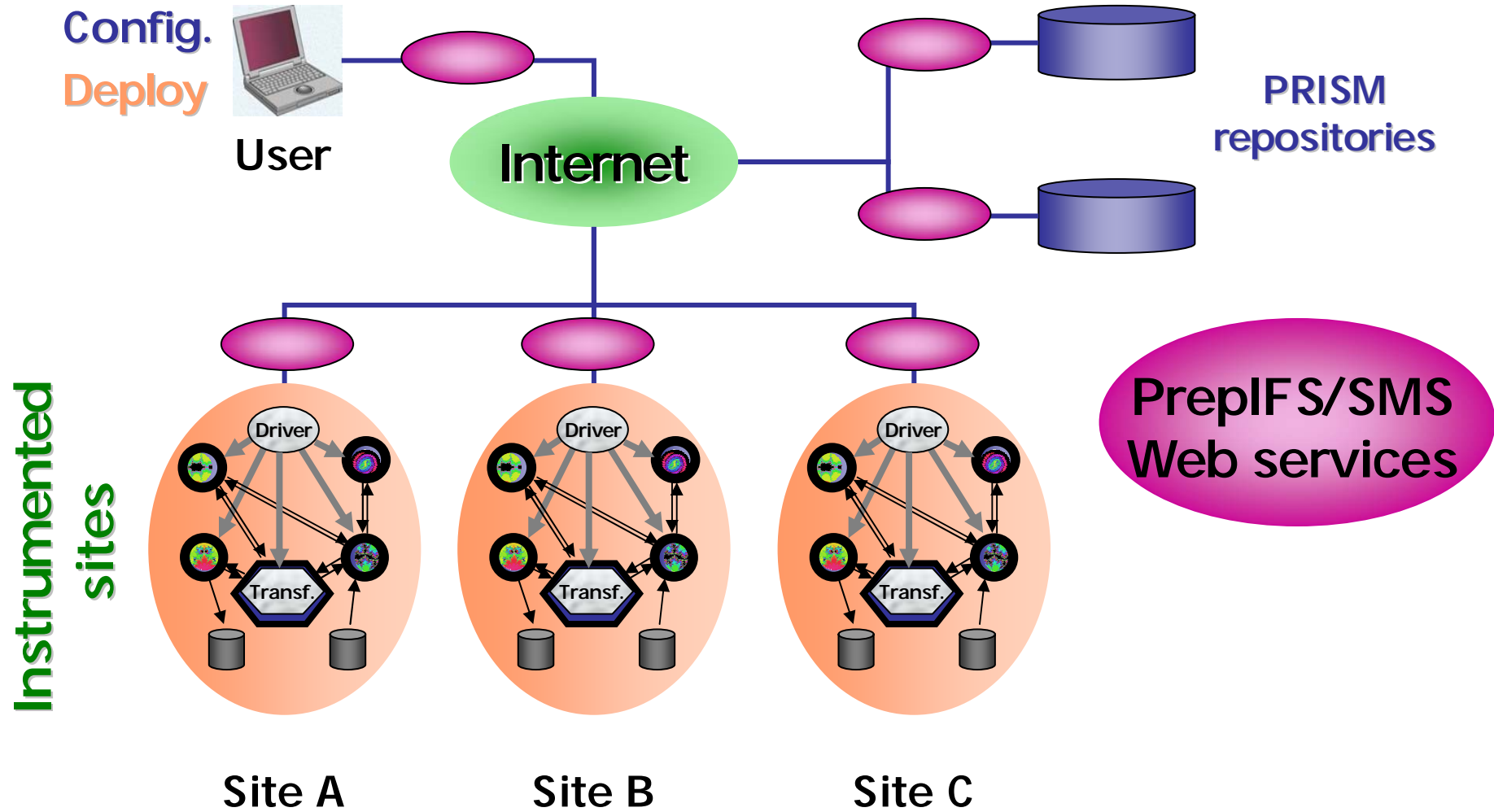
PRISM: Adapting Earth System Component Models



Configuration Management and Deployment

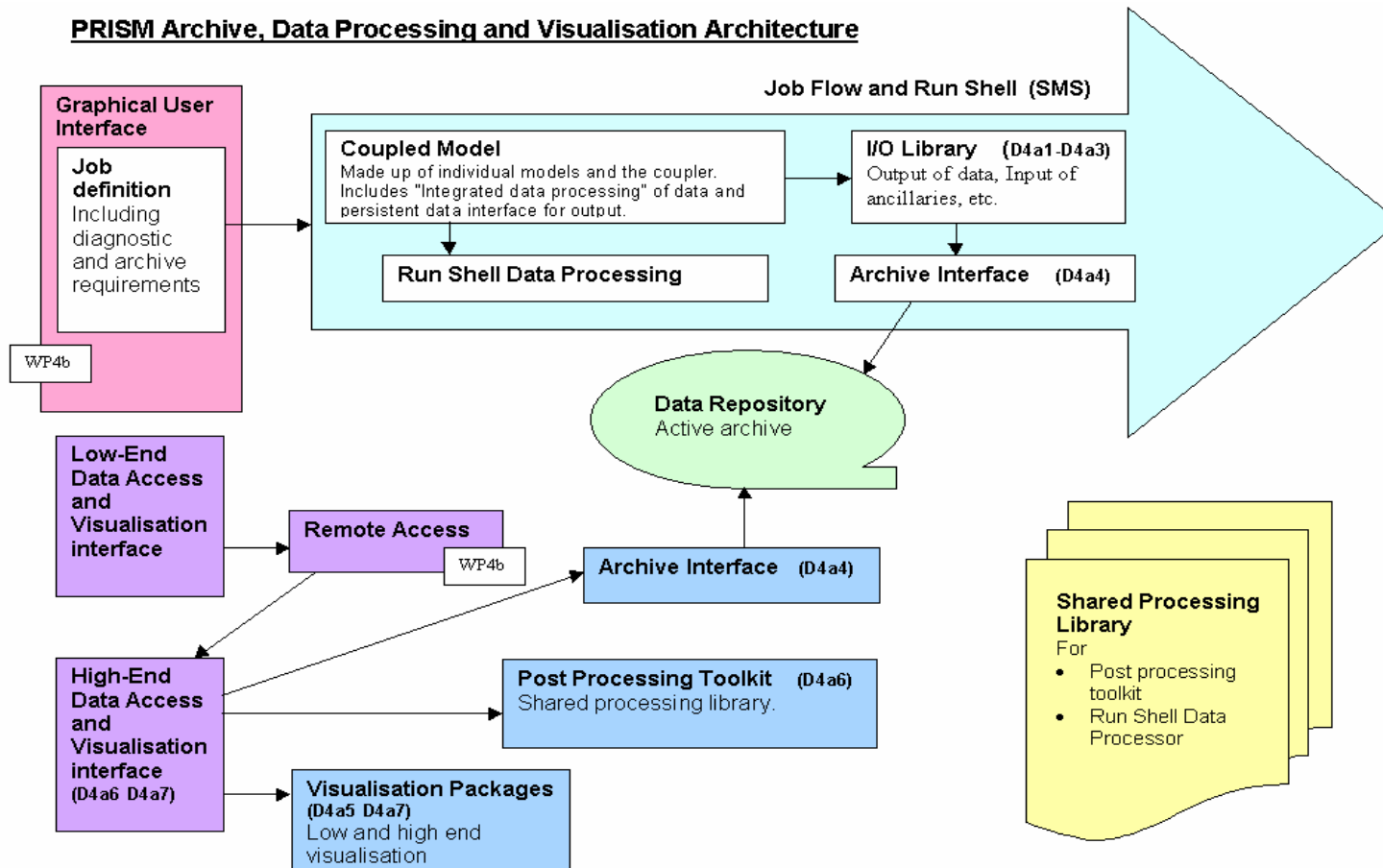


PRISM GUI Remote Functionality



Data Processing and Visualisation

PRISM Archive, Data Processing and Visualisation Architecture



Demonstration experiments

Platforms

Assembled Coupled models

Platform		Component	Model	Platform	Platform	Platform	
		Combination		NEC SX6	SGI IRIX64	Fujitsu VPP5000	IBM Power 4
OASIS3 models	toy coupled			Andrea Carril by INGV	Peter van Velthoven and Frans Alkemade by KNMI + Reiner Vogelsang* by SGI	Serge Planton and Karine Maynard by MétéoFrance+ Jean Latour* by FSE	Luis Kornbluh by MPI-MET
ECHAM5 + MPI-OM				Andrea Carril by INGV	Peter van Velthoven and Gabriella de Martino by KNMI + Reiner Vogelsang* by SGI	Jean Latour by FSE + Andrea Carril* by INGV	Luis Kornbluh and Noel Keenlyside by MPI-MET + Hannes Thiemann* by MPI-MET + Nils Wedi* by ECMWF + Angelo Mangili* and Francesco Benvenuto* by SCSC (OPEN HOUSE)
ECHAM5 + ORCA-LIM (sea-ice turned on)				Andrea Carril by INGV			
ARPEGE4 + ORCA-LIM (sea-ice turned off)				Thomas Schoenemeyer by NEC + Serge Planton* by MétéoFrance	No human resources	Serge Platon and Karine Maynard by MétéoFrance + Sophie Vackle* by CERFACS* + Claire Levy* by IPSL + Jean Latour* by FSE	
ARPEGE4 + MPI-OM				Thomas Schoenemeyer by NEC + Serge Platon* by MétéoFrance + Johann Jungclaus* by MPI-MET			
LMDZ + ORCA-LIM (sea-ice turned on)				Arnaud Caubel and Marie-Alice Foujols by IPSL	No human resources	Jean Latour by FSE + Arnaud Caubel* by IPSL	
HadAM3 ORCA-LIM (sea-ice turned off)	(SRES) +			Jeff Cole by CGAM			

PRISM: Availability

- PRISM has delivered
 - A tool box
 - A network of expertise and
 - Demonstration runs
- Community acceptance is growing

PRISM: Availability

PRISM software:

Coupler
Interface libraries
SCE, SRE
Vis.- and anal.-tools
....
will be available under an
Open Source License for
Earth System research
purposes

PRISM Framework:

PRISM software +
Component Models
Graphical User Interface
....
will be available under the
resp. licenses of the
components for Earth
System research
purposes at no cost within
Europe

... Maintained by CERFACS, ECMWF, IPSL, MetOffice,
MPI-Met, Manufacturers, and others

Collaboration

- ESMF (supporting software, PMIOD, MOM4)
- FLUME (PRISM framework)
- PCMDI (visualisation, PMIOD)
- CF group (CF names)
- NERC (BADC & CGAM) (data, PMIOD)
- M&D, MPI (data)
- Earth Simulator (install PRISM system V.0)

Future Work

- Key need for sustainment:
 - Tool box needs to be
 - Maintained
 - Developed
 - Kept open for new features
 - Network of expertise
- Key need for development:
 - Tool box needs to be extended for
 - Assimilation
 - Data Management
 - Further Modularisation
 - ...

PRISM: Sustainment

Distributed Team needs to

1. Co-ordinate

- Improvement
- Maintenance
- User support

Of/for current PRISM framework for the benefit of the Earth system modelling community

2. Support

- Adaptation of more component models to PRISM technical standards
- Installation of PRISM framework at additional computing sites
- Usage of PRISM framework

3. Prepare for the future

- Seek additional funding
 - Propose evolution, adaptation and development strategies
-
- avoid divergence
 - organize benefits from PRISM communities expertise

PRISM: Sustainment

- Tasks for the Team:
 - Management
 - Coordination
 - Interface to Community, Outreach
 - Funds
 - Technical
 - Productise framework
 - Maintenance, improvement and QC
 - β -Testing
 - Services (Repository, Users, Training etc.)

PISM: Sustainment

- What it takes:
 - Up to 7 people in first phase
 - Consortium Agreement
 - (3 yrs, renewal 1 yr)
 - Management structure
 - Avoid prevalence of single institution
 - Ensure involvement of user community
 - Usage of existing structures where possible
- Available already:
 - Interest from many institutions
 - CERFACS, ECMWF, Met Office, M&D, NCAS, NEC-CCRLE, CNRS, IBM, SGI, Fujitsu, MPI, Météo-France, UCL, INGV, SMHI, KNMI, University of Berlin
 - Commitment from some ...

PRISM: Sustainment

- Next steps:
 - Meeting this week in Paris for further discussion
 - Consideration of new applications for funding

The End

- Thank you!
- Questions?

<http://prism.enes.org>

budich@dkrz.de

Prozess - Sicht

