Foundation SCOR for Science

THE GENEVA ASSOCIATION

How Will Risk Modelling Shape The Future of Risk Transfer?

Extreme Events & Climate Risk Forum

Scientific Seminar

SCOR, Paris, 9 March 2017

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Welcome & Opening Remarks

DENNIS KESSLER
CEO and Chairman of SCOR
Co-Chair of Extreme Events and Climate Risk of the Geneva Association

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Keynote Speech

PROFESSOR JEAN TIROLE
Chairman, Toulouse School of Economics (TSE)
Chairman of the Executive Committee, Institute for Advanced Study in Toulouse (IAST)

ON ECONOMIC MODELING

SCOR/Geneva Association conference on "How will risk modelling shape the future of risk transfer?"

SCOR, Paris, March 9, 2017

Jean TIROLE

Toulouse School of Economics

We need models for

1. *Public policy*
2. *Macroeconomic forecasting*
3. *Business analysis*
4. *Mixed usages*

Why do we use models?

Four purposes:

1. *Communicate*
2. *Make assumptions explicit*
3. *Check the logic*
4. *Conduct empirical tests*

The art of modeling

1) Identify *substantive core*

2) Describe the *decision-makers' goals* as well as *hypotheses about their behavior*

3) *Test robustness*

Empirical analysis: how much theory?

Continuum of intensities in the use of theory.

1) *Theory-light or -free empirical work*, identify co-variations, little emphasis on causality.

   Limitations:

   - Environment must be stable.
   - Decisions may be multidimensional
   - Causality

2) *Using theory to improve quality of predictions*.
   Example: Blanchard-Quah (AER 1989).

3) *More structural approaches.*

When theoretical work is most useful

1) *Causality*

2) *Normative analysis*

3) *Shortage of data*
   - new technologies
   - deregulation of an industry, transition toward a market economy
   - new financial instruments

4) *Local data only*
   - Skewness of distribution
   - Price- and usage- dependent complementarity/substitutability
   - “New world”

Cognitive styles: Foxes and hedgehogs

"The fox knows many things, but the hedgehog knows one big thing."

- Forty years ago, economists by and large were hedgehogs.
- Economists are more fox-like today
- Science needs both foxes and hedgehogs.

In public debates, is it better to be a fox or a hedgehog economist?

Philipp Tetlock:

- For almost 20 years, studied the predictions of 284 experts in political science. In total he asked them to make 28,000 predictions:
- Foxes produce far better predictions.

Relatedly, is there a wisdom of the crowd for models?

Cognitive styles: Foxes and hedgehogs

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Relatedly, is there a wisdom of the crowd for models?

Conclusion: the need for humility

- Theoretical limits
- Empirical limitations
  - Data limitations
  - From internal to external validity
- Non-linear phenomena
- Economic agents are forward-looking. Determinacy may fail.

Economists' role in society.

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Panel 1

Challenges, opportunities and lessons learned from 25 years of developing and utilizing Catastrophe (CAT) risk models for risk transfer applications

Panel 1

MODERATOR
IAN BRANAGAN
Group Chief Risk Officer &
Senior Vice President
RenaissanceRe Holdings Ltd.

JAYANTA GUIN
Executive Vice President
and Chief Research Officer
AIR

LIXIN ZENG
Chief Executive Officer
AlphaCat Managers Ltd

DICKIE WHITAKER
Senior Insurance & Risk Advisor
at the UK Department for
International Development
OASIS

ALEXANDRE ALLMANN
Head of the Georisk team
Munich Re

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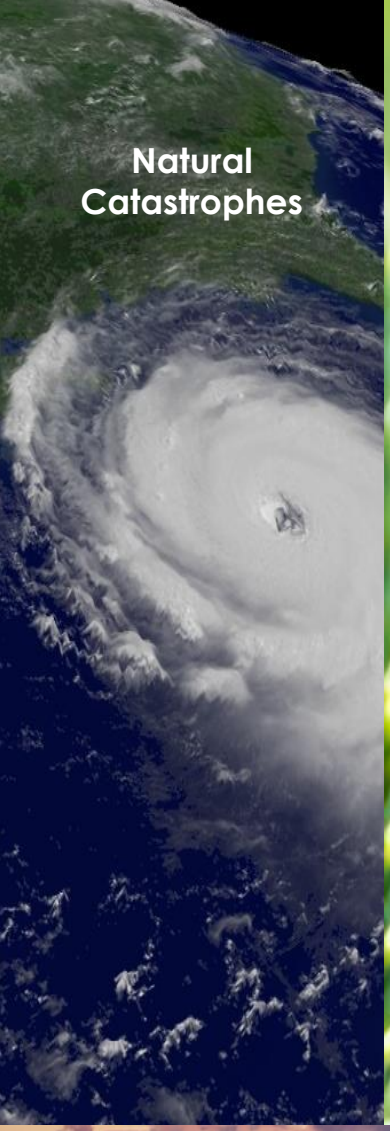
Statement by

JAYANTA GUIN
Executive Vice President
and Chief Research Officer
AIR


Natural
Catastrophes

Crop and
Agriculture

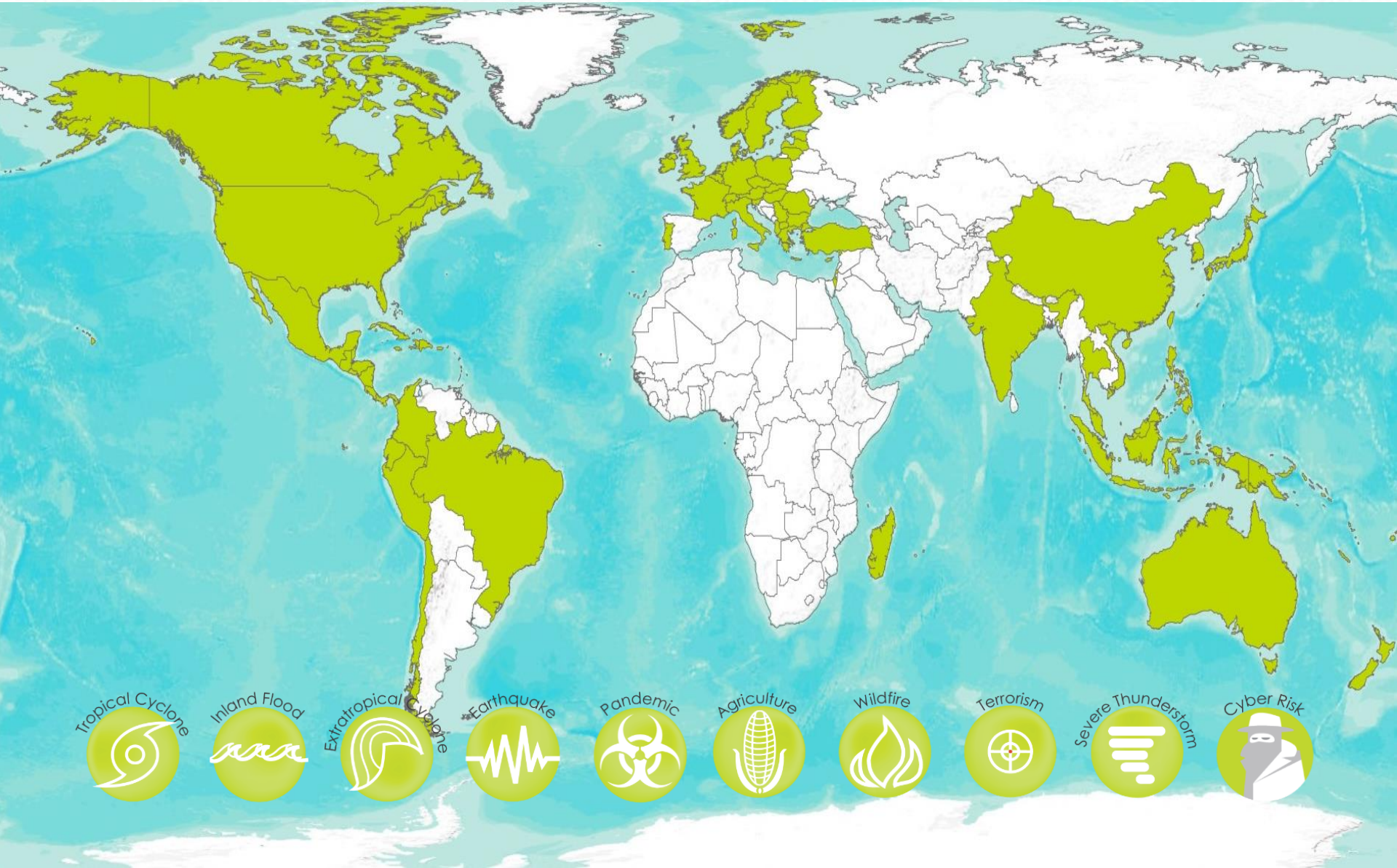
Terrorism &
Political Risk

Life and Health

Casualty &
Cyber

Climate Change

Cat Analytics in More Than 110 Countries



Coffee & Tea

We will continue at 11.45

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Panel 2

Next generation risk models:
approaches, opportunities, challenges

Panel 2

MODERATOR
PAUL NUNN
Head of Catastrophe Risk Modelling
SCOR Global P&C

FEDERICO WAISMAN
Head of Analytics
Ariel Re

ROBERT MUIR WOOD
Chief Research Officer
RMS

MOLLY JAHN
Professor in the Department
of Agronomy
University of Wisconsin-Madison

MADELEINE C. THOMSON
Senior Research Scientist
Columbia University

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Statement by

FEDERICO WAISMAN
Head of Analytics
Ariel Re

Next Generation Risk Models: approaches, challenges and opportunities

Federico Waisman
Head of Research & Development

March 9, 2017

Ariel Re
Member Argo Group

ARGO GROUP
Get there together

Next Generation Risk Models: approaches, challenges and opportunities

Trends:	Opportunities:	Challenges/Risks:
▪ Technology	▪ Performance, efficiency	▪ Same cloud provider
▪ Integration	▪ Capital model, UW, Admin.	▪ Dev. Costs, dependencies
▪ Science / Coverage / More Vendors	▪ Accuracy, policy wordings, forecasting vs. modelling, tested?	▪ Validation, resources, training of personnel
▪ Utilization Order	▪ Pre-bind, live decisions vs. post bind	▪ Model-dependent, lose practicality
▪ Increase Automation	▪ Performance, less errors	▪ Roles/cultural changes

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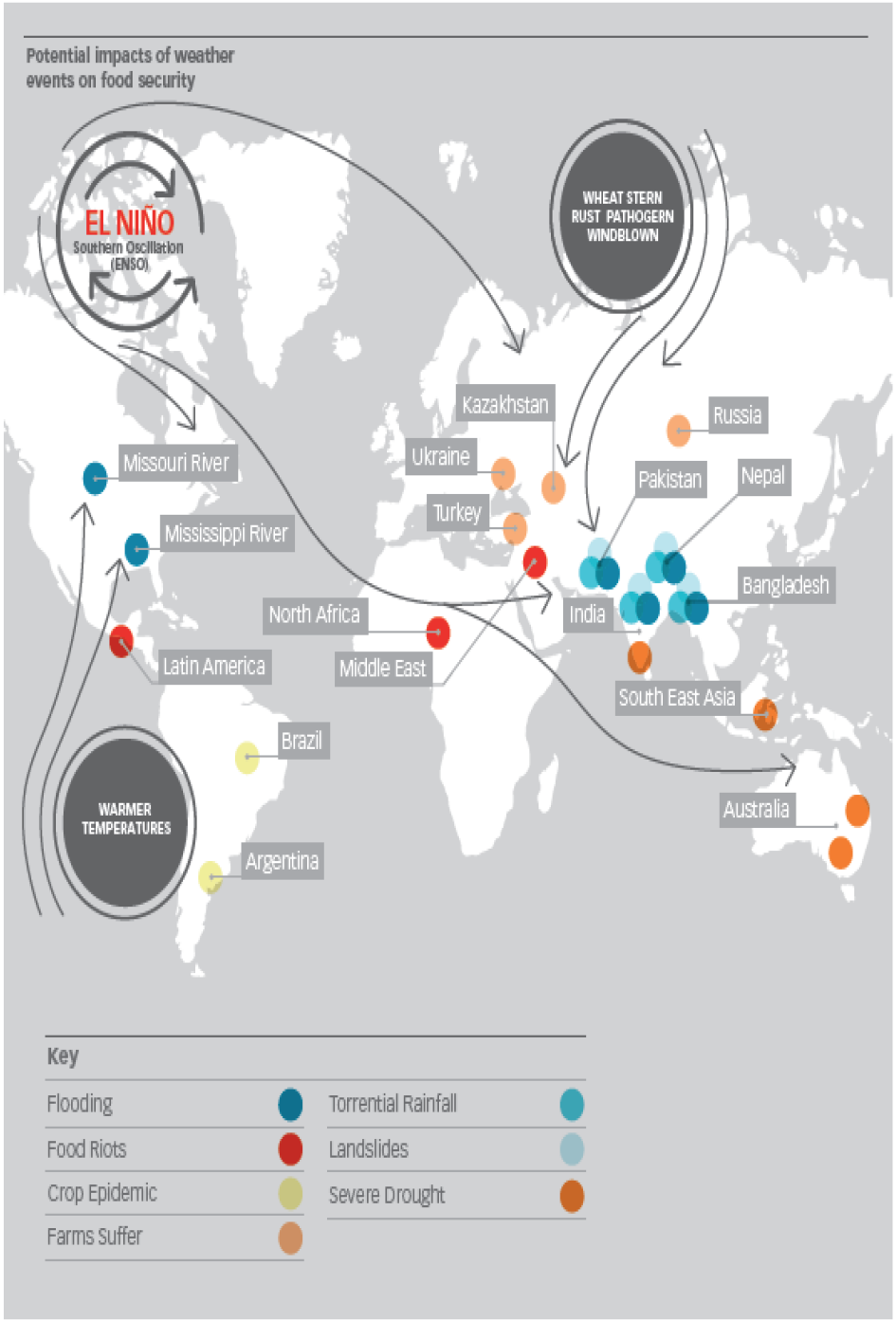
Statement by

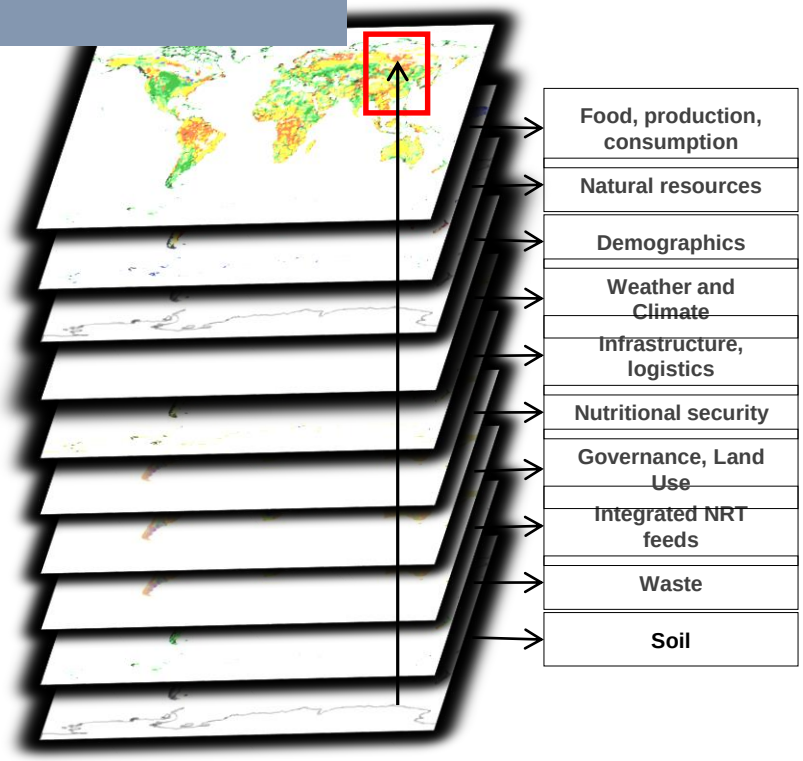
MOLLY JAHN
Professor in the Department
of Agronomy
University of Wisconsin-Madison


Potential impacts of weather events on food security
EL NIÑO
Southern Oscillation (ENSO)
WHEAT STERN RUST PATHOGERN WINDBLOWN
WARMER TEMPERATURES
Missouri River
Mississippi River
Latin America
Brazil
Argentina
Kazakhstan
Ukraine
Turkey
North Africa
Middle East
India
Pakistan
Russia
Nepal
Bangladesh
South East Asia
Australia
Key
Flooding
Food Riots
Crop Epidemic
Farms Suffer
Torrential Rainfall
Landslides
Severe Drought

LLOYD'S
Food inflation
Struggle
FEAST OR FA
BUSINESS AND INSURANC
SAFETY AND SECURITY
Global Foo
Emerging Risk Report – 2015
Food Chain Reaction—
A Global Food Security Game
Mary "Kate" Fisher, Ph.D., Yee San Su, Ph.D.
December 2015
nature
GROWTH WITHOUT TEARS
DRAFT
The Risks of Multiple Breadbasket Failures in the 21st Century: A Science Research Agenda

Knowledge Systems for Sustainability

- *Data, information, and knowledge* assets
- *Modeling* of complex systems
- *Learning systems*



KSS
Knowledge Systems for Sustainability

WWHGD
WORLD-WIDE HUMAN GEOGRAPHY DATA
Working Group

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Statement by

MADELEINE C. THOMSON
Senior Research Scientist
Columbia University

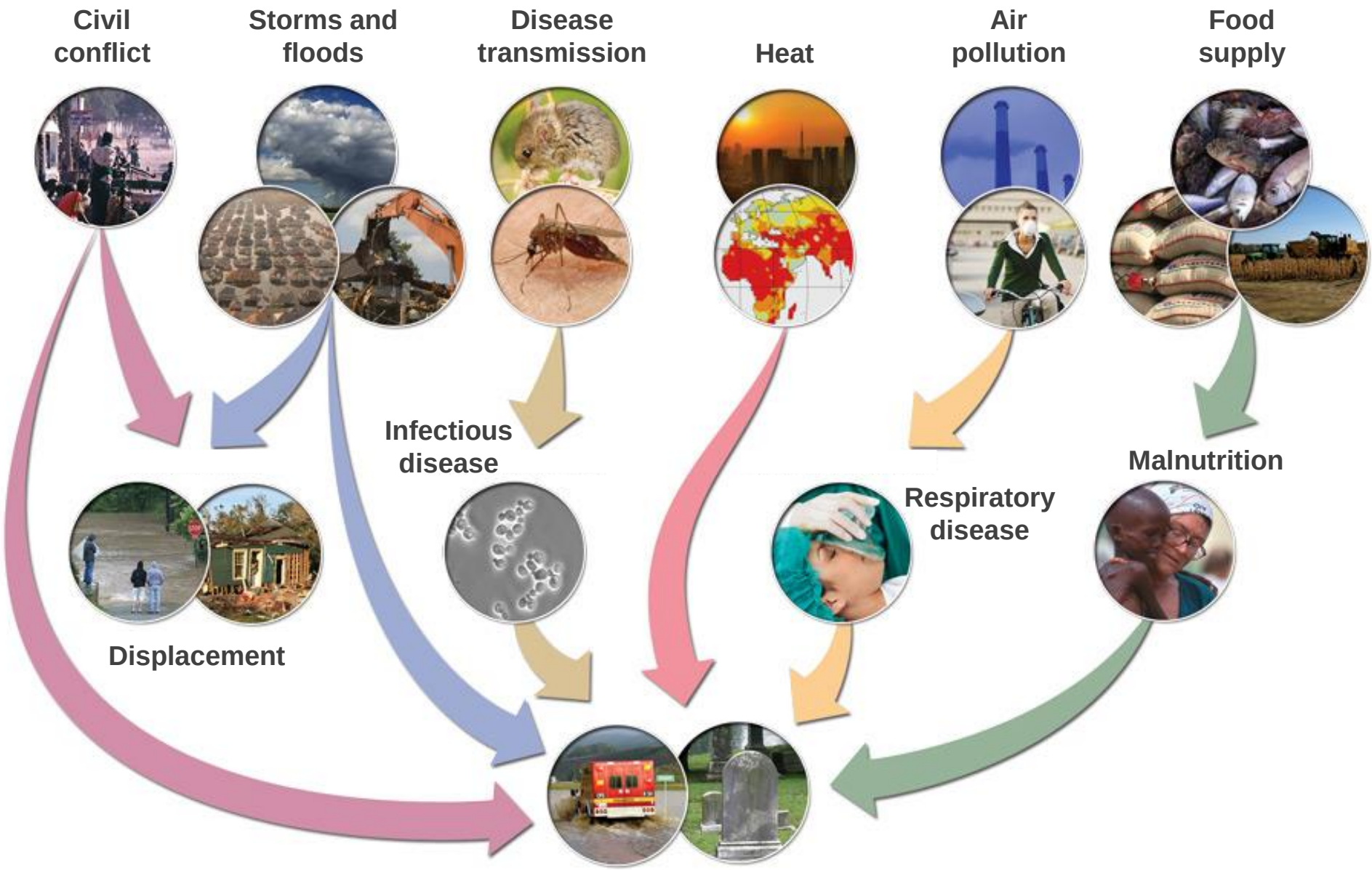
Panel 2: Next generation risk models: approaches, opportunities, challenges
Health

Madeleine C. Thomson

Extreme Events and Climate Risk Forum - Scienti c Seminar SCOR, Paris, 9 March 2017

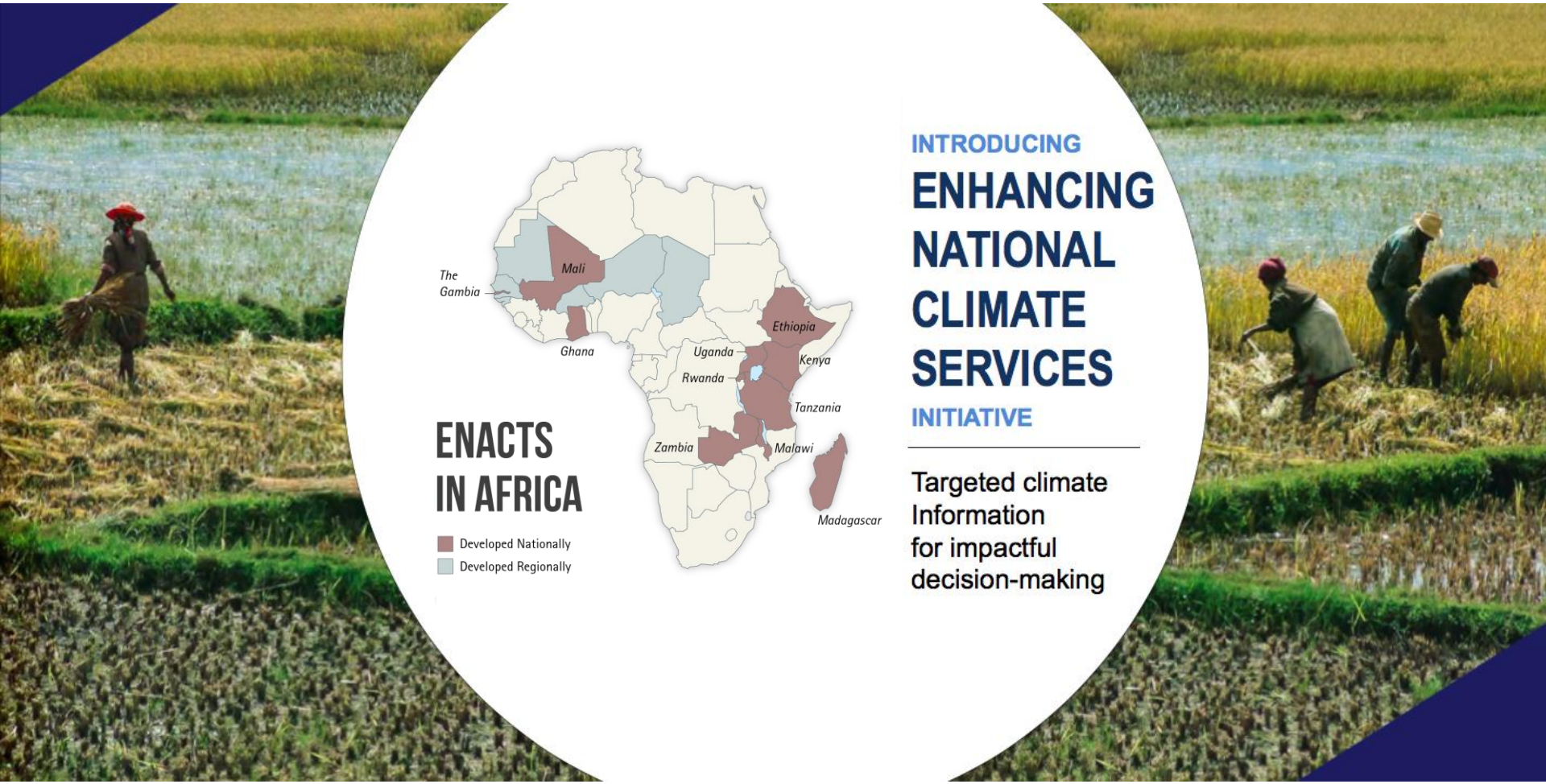
International Research Institute for Climate and Society, Department of Environmental Health Sciences, Mailman School of Public Health, Columbia University, New York.

Collaborating Centre on early warning systems for malaria and other climate sensitive diseases 2004+



Adapted from Borowski

ENACTS



ENACTS IN AFRICA

Developed Nationally

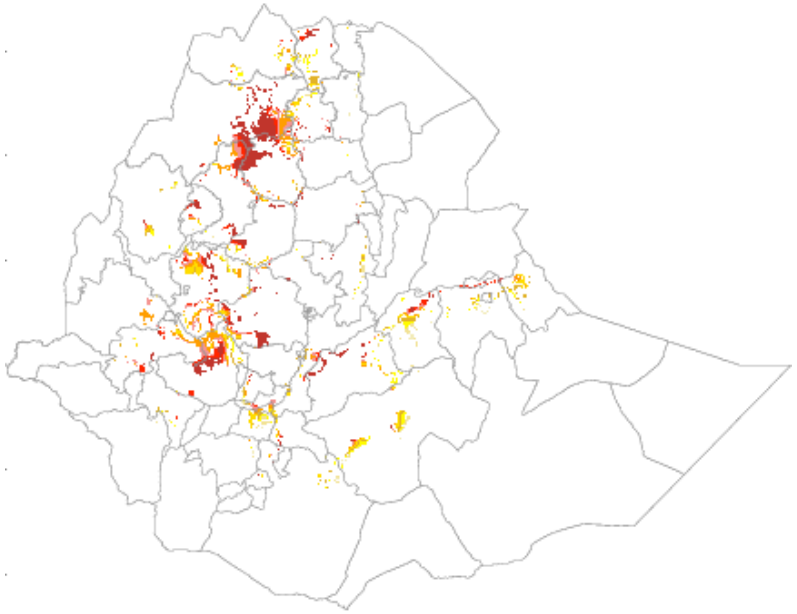
Developed Regionally

INTRODUCING

ENHANCING NATIONAL CLIMATE SERVICES

INITIATIVE

Targeted climate Information for impactful decision-making



10 million **more** people exposed to malaria

Rising minimum temperatures, 1982-2015

ETHIOPIA

Lunch

We will continue at 14.15

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Panel 3

Harnessing latest development in weather/water/ climate research, earth observations, forecasting for current and next generation of forward-looking risk models

Panel 3

MODERATOR
MARYAM GOLNARAGHI
Director of Extreme Events
and Climate Risk
The Geneva Association

JIANMING YIN
Executive Vice President and leads
the Research & Modelling group
Tokio Marine Technologies

GHASSEM R. ASRAR
Director
Joint Global Change Research
Institute of the Pacific Northwest
National Laboratory

JULIA SLINGO
Former Chief
Scientist
UK Met Office

JOHNNY CHAN
Chair Professor of Atmospheric Science
and the Director of the Guy Carpenter
Asia-Pacific Climate Impact Centre

LAWRENCE BUJA
Director Climate Science &
Applications Program
National Center for Atmospheric
Research in Boulder, Colorado

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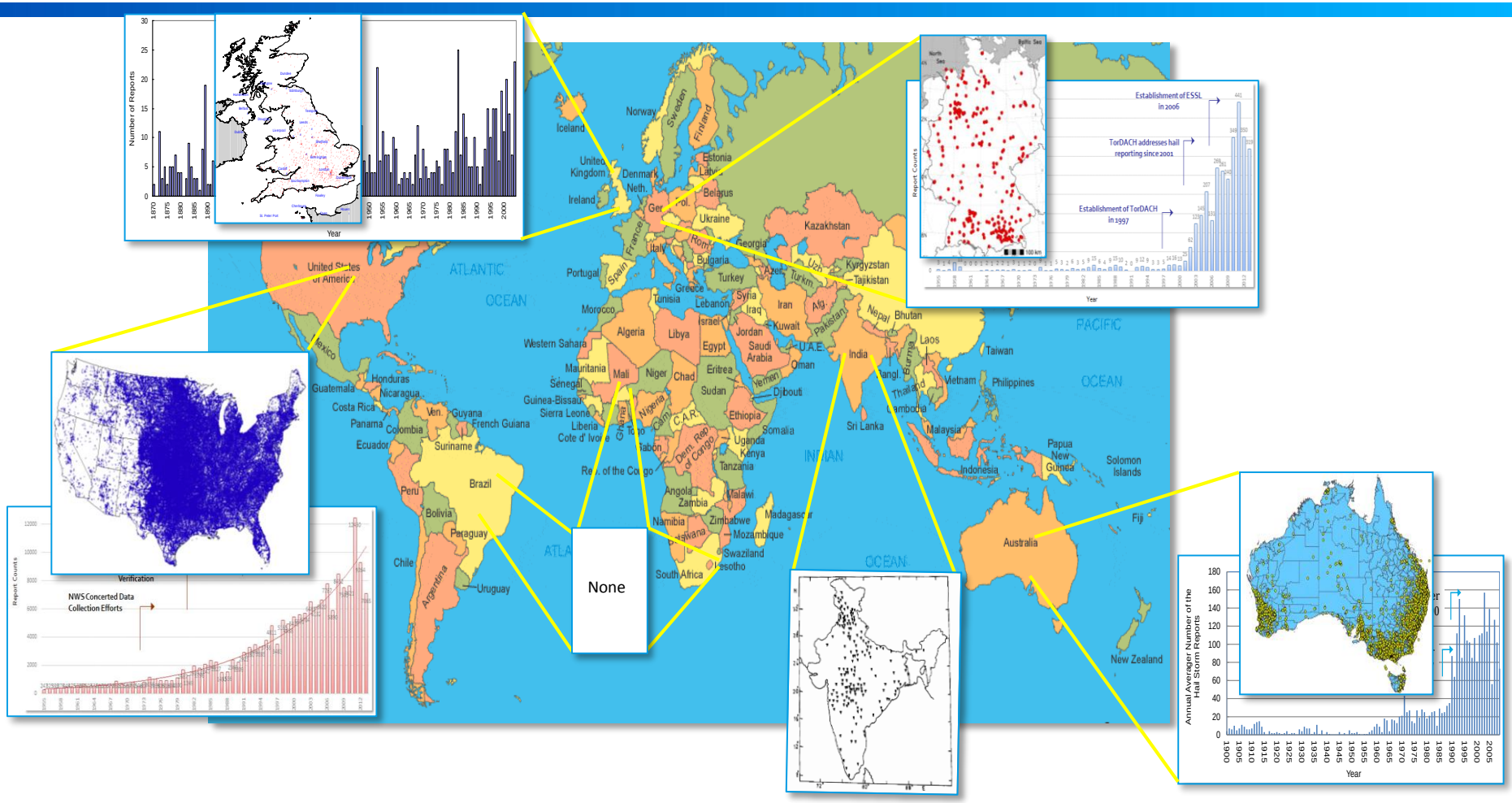
Statement by

JIANMING YIN
Executive Vice President and leads the Research & Modelling group
Tokio Marine Technologies

Conventional Data: Quality, Consistency & Completeness

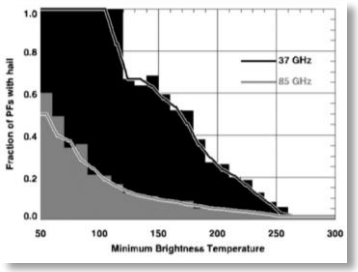


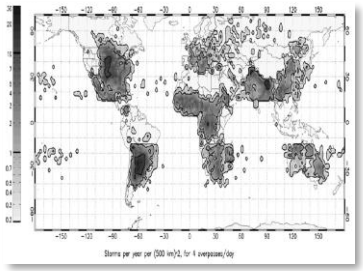
TOKIO MARINE

TMTech Global Hail Risk Modeling Methodology

Satellite Imagers

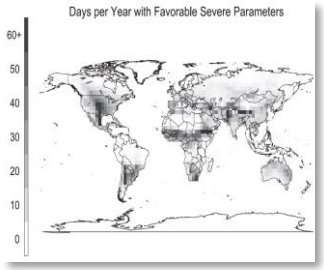
Cecil et. al (2012)



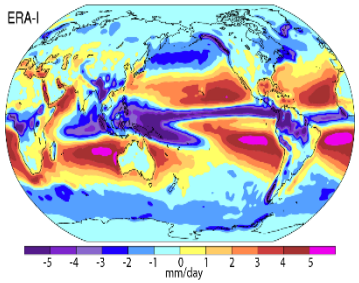


Reanalysis Data

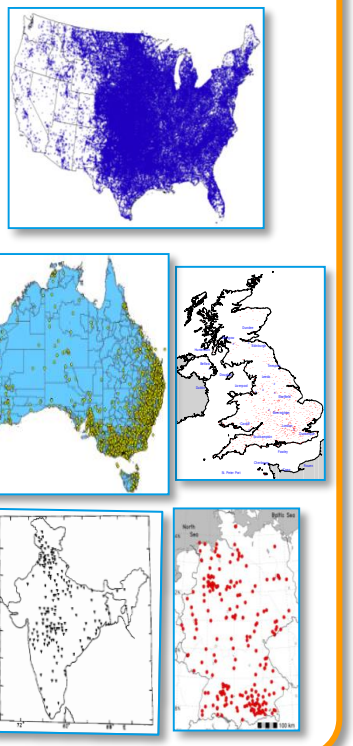
Brooks et. al (2003)



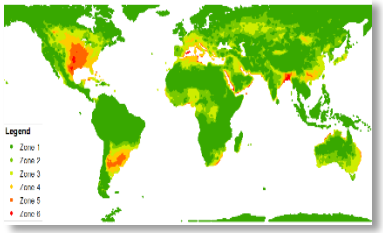
CFSR T382

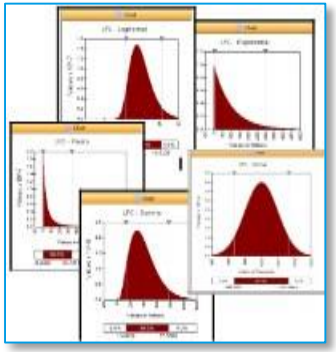


Ground Reports



TMTech Global Hail





Sources: Cecil, D. and Blankenship, C., 2012: Toward a Global Climatology of Severe Hail Storms as Estimated by Satellite Passive Microwave Imagers, *Journal of Climate*, Vol. 25
Brooks, et al., 2003: The spatial distribution of severe thunderstorm and tornado environments from global reanalysis data, Atmospheric Research, Vol 67-68

TOKIO MARINE

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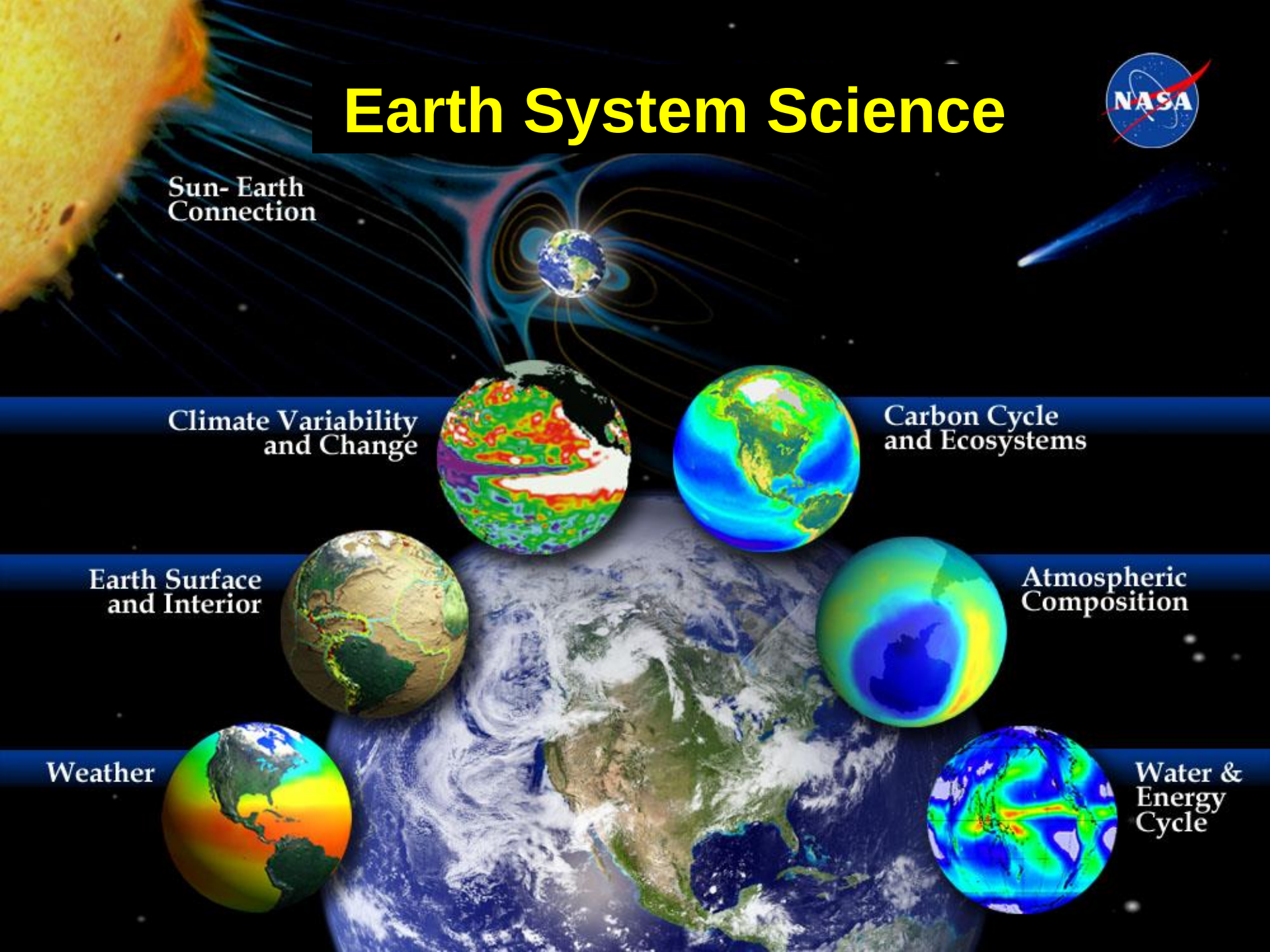
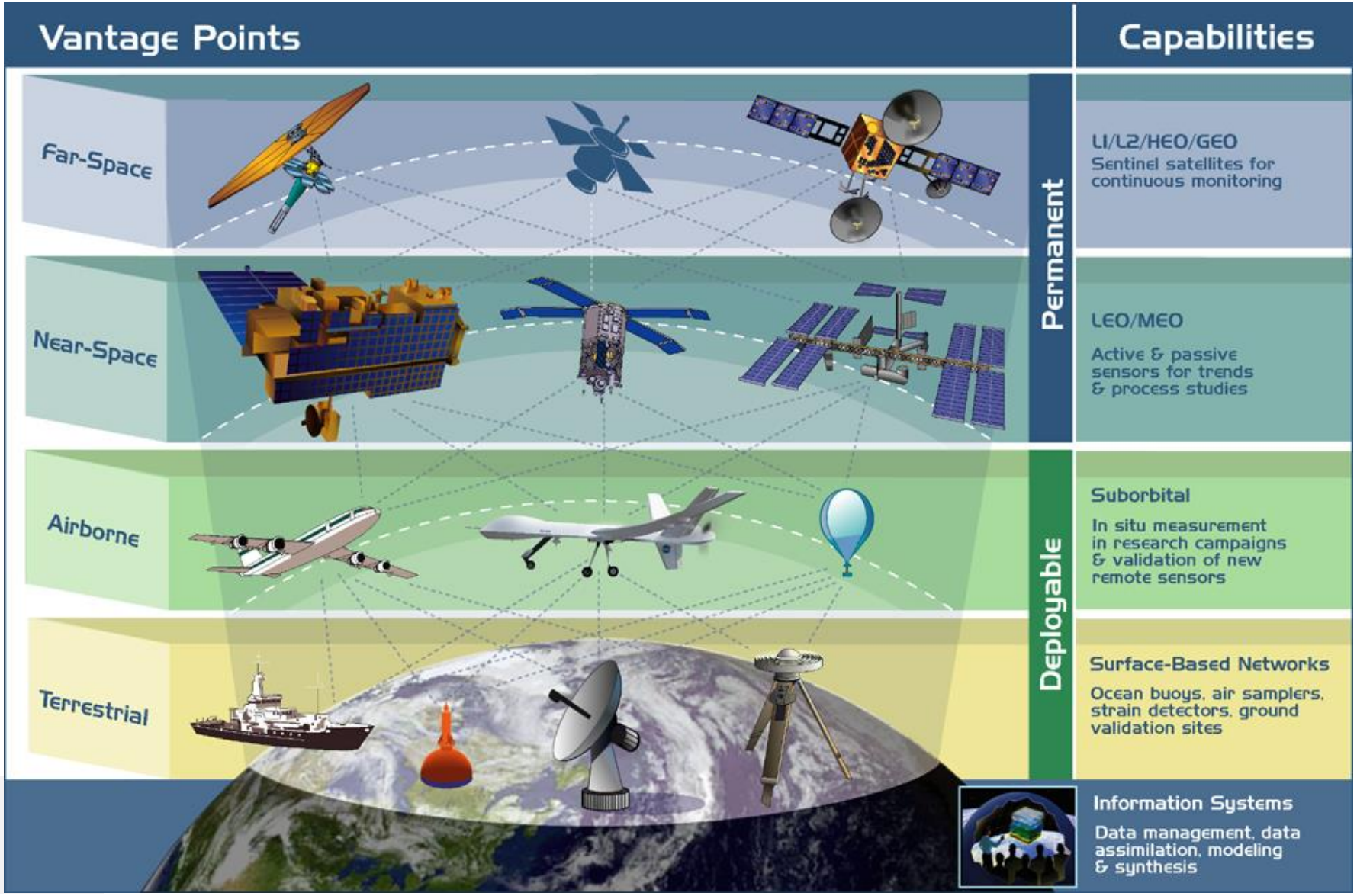
Statement by

GHASSEM R. ASRAR
Director
Joint Global Change Research
Institute of the Pacific Northwest
National Laboratory

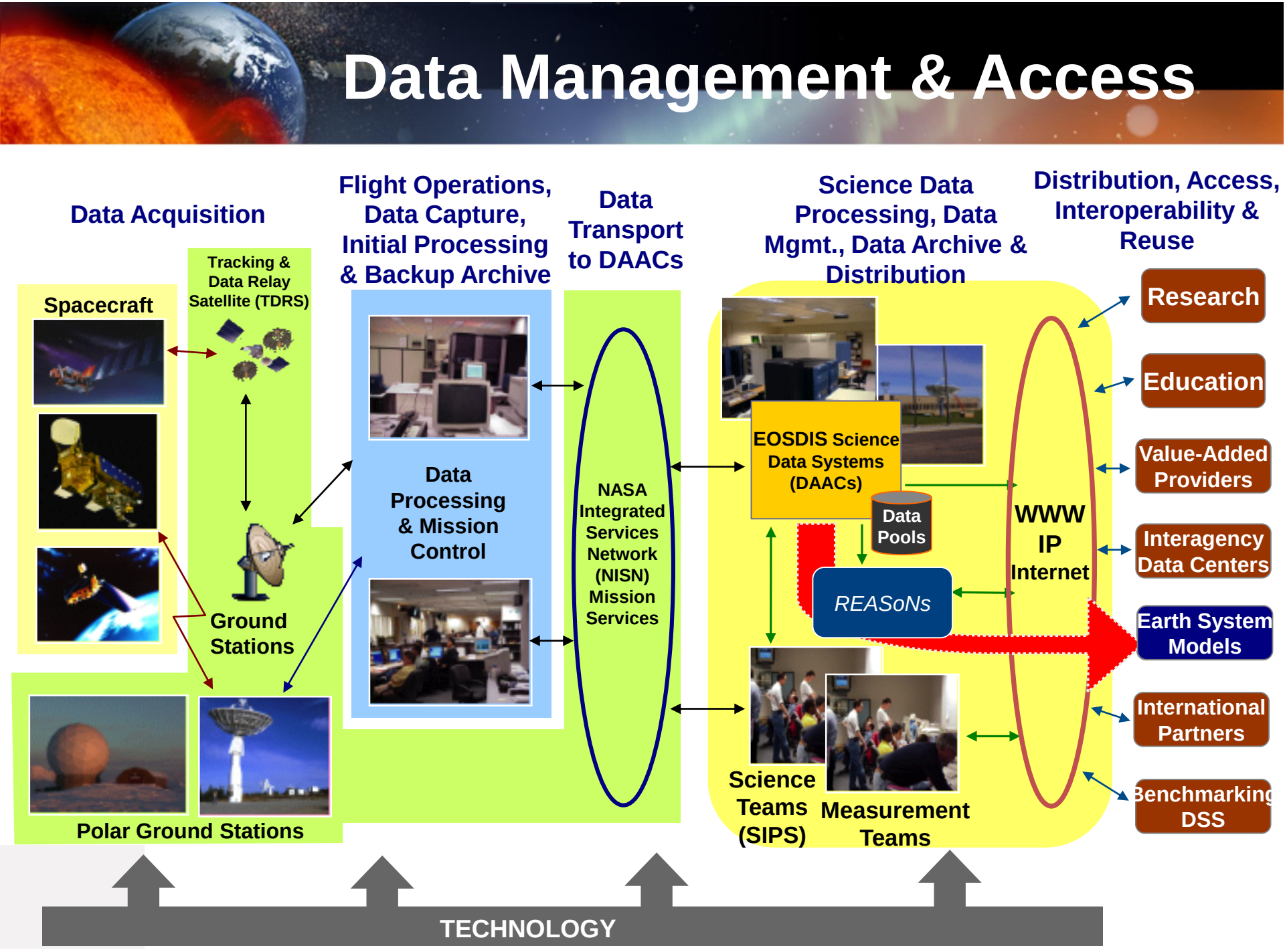
Earth System Science



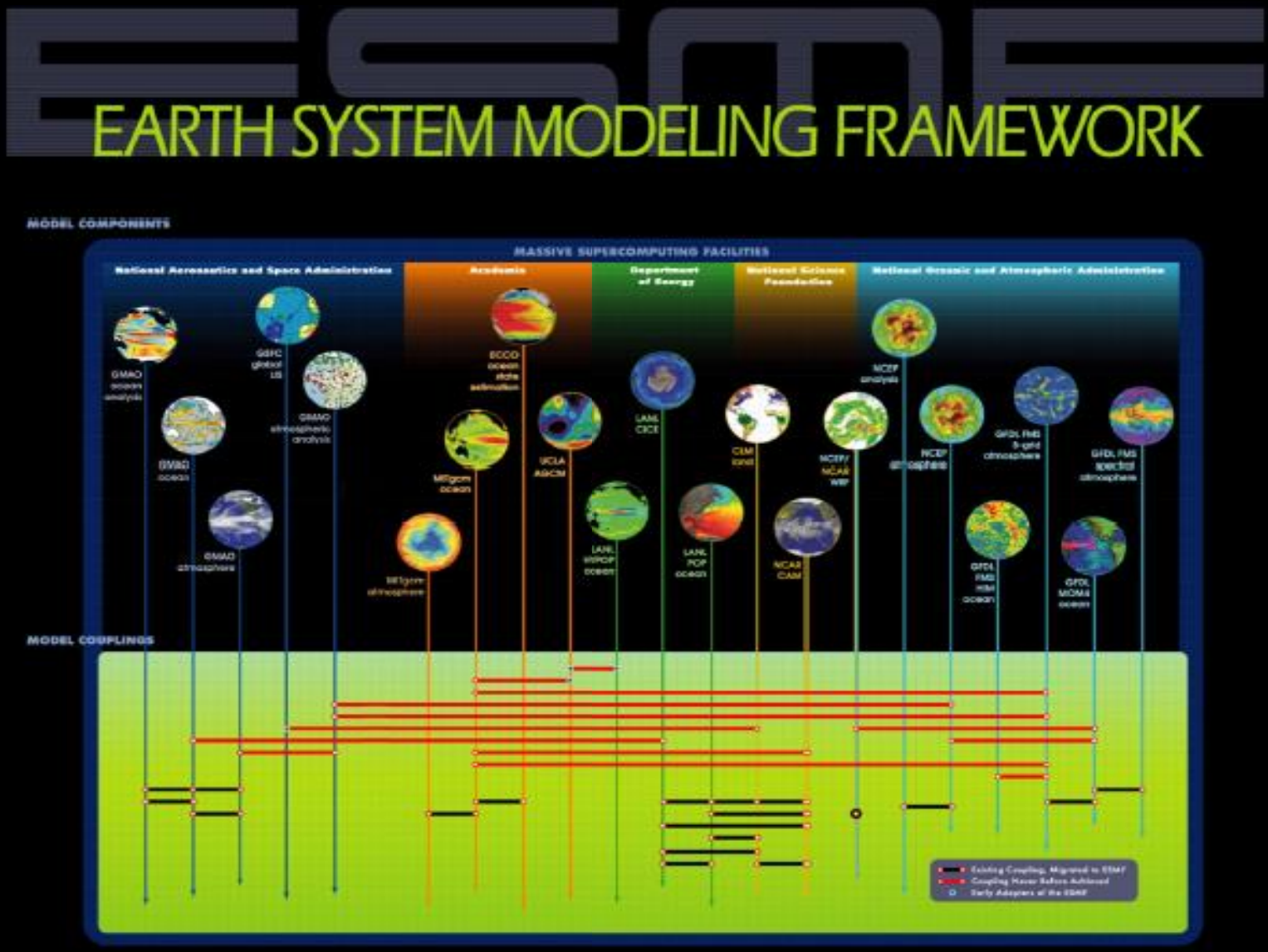
Earth Observing System



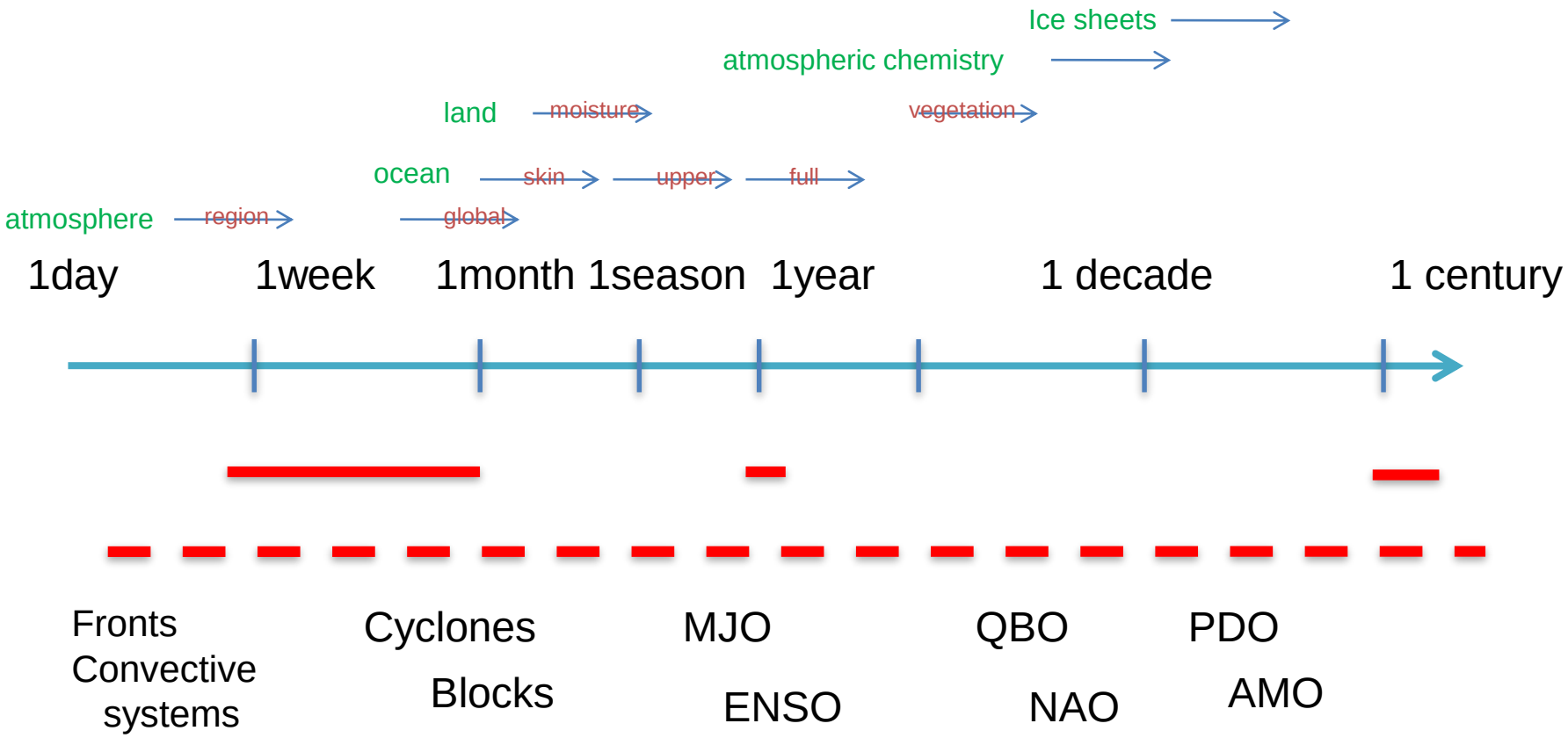
Data Management & Access



Earth System Models



Seamless Prediction of Earth System



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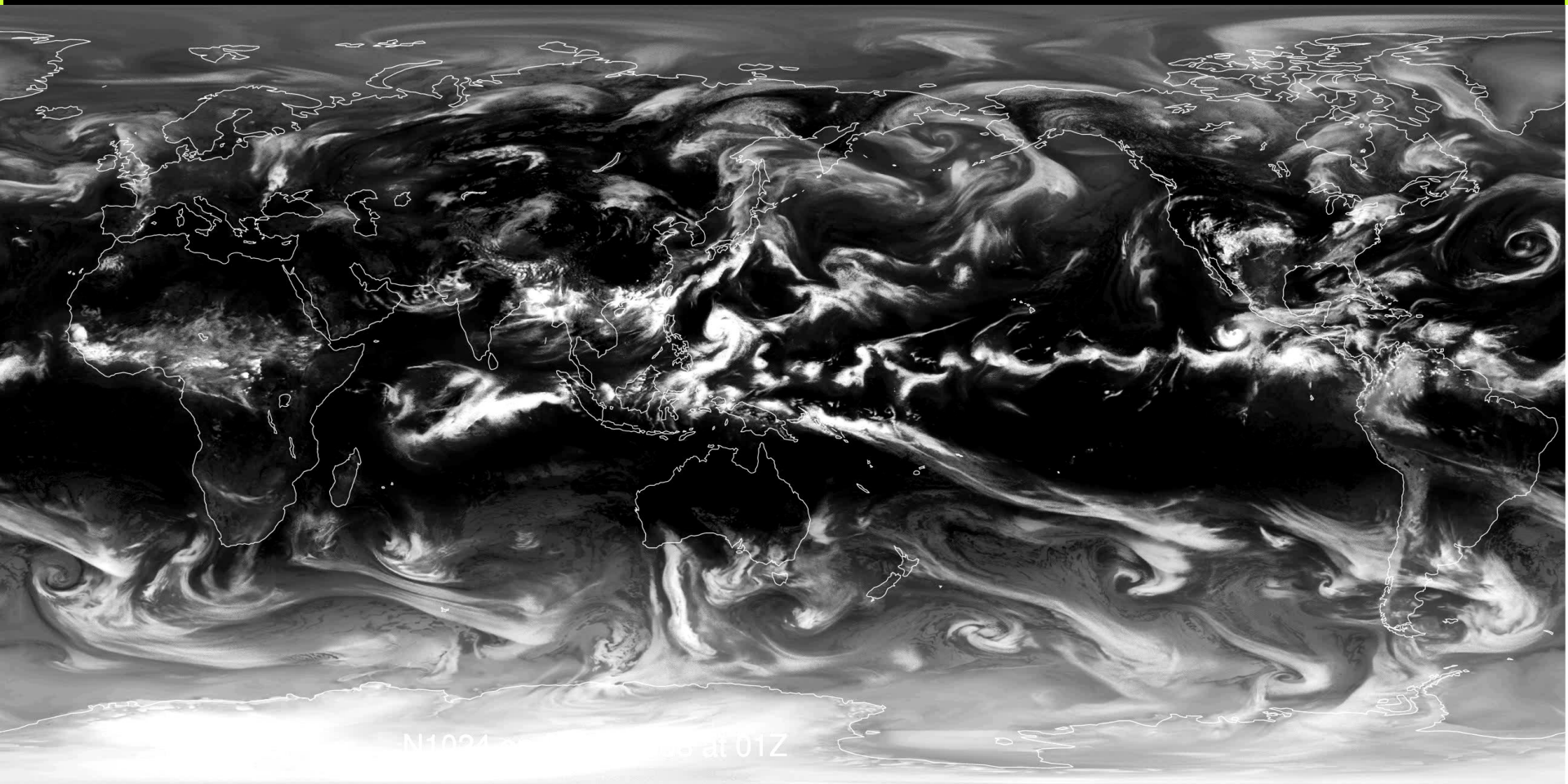
Statement by

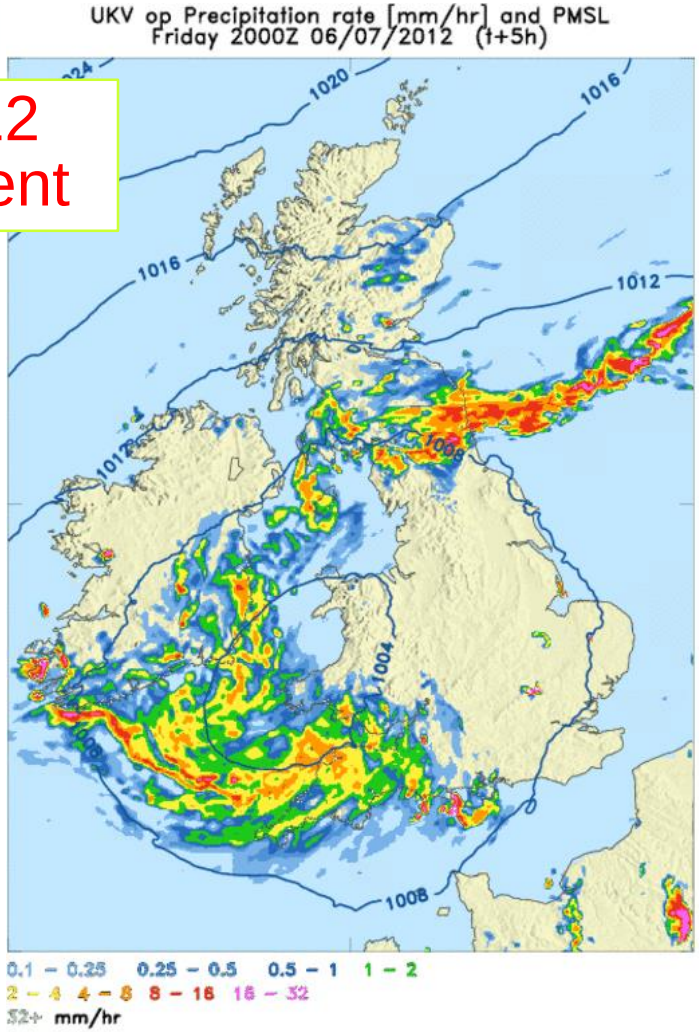
JULIA SLINGO
Former Chief Scientist
UK Met Office

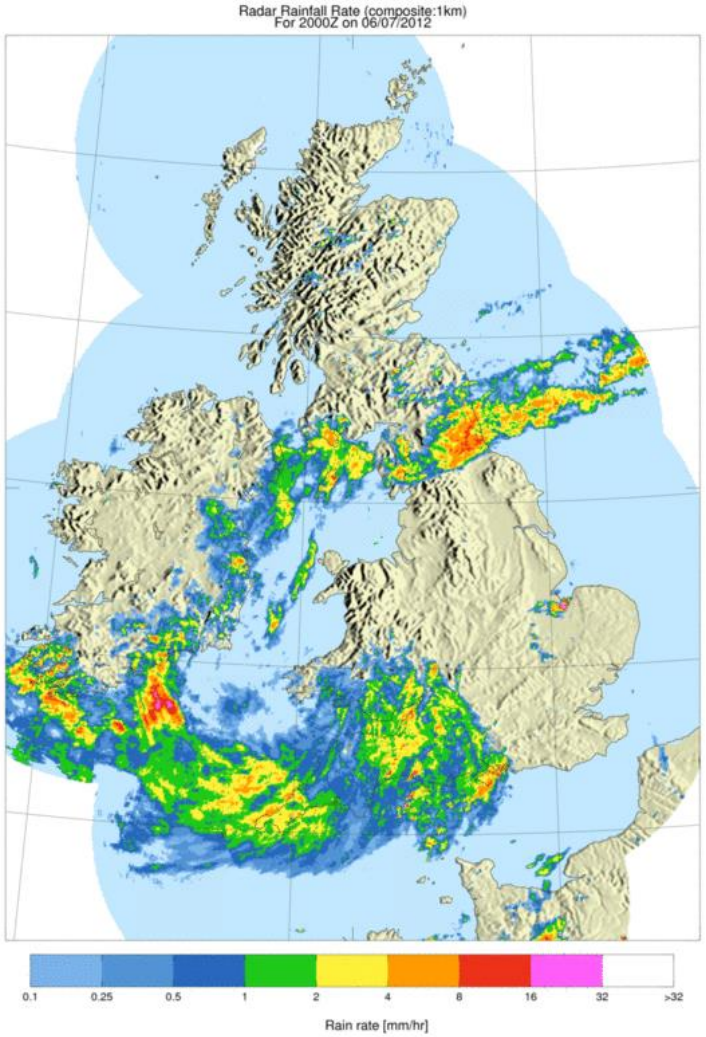
Met Office



Science and technology of kilometer-scale weather forecasting today can be used to assess climate risks of tomorrow

July 2012 storm event





www.metoffice.gov.uk

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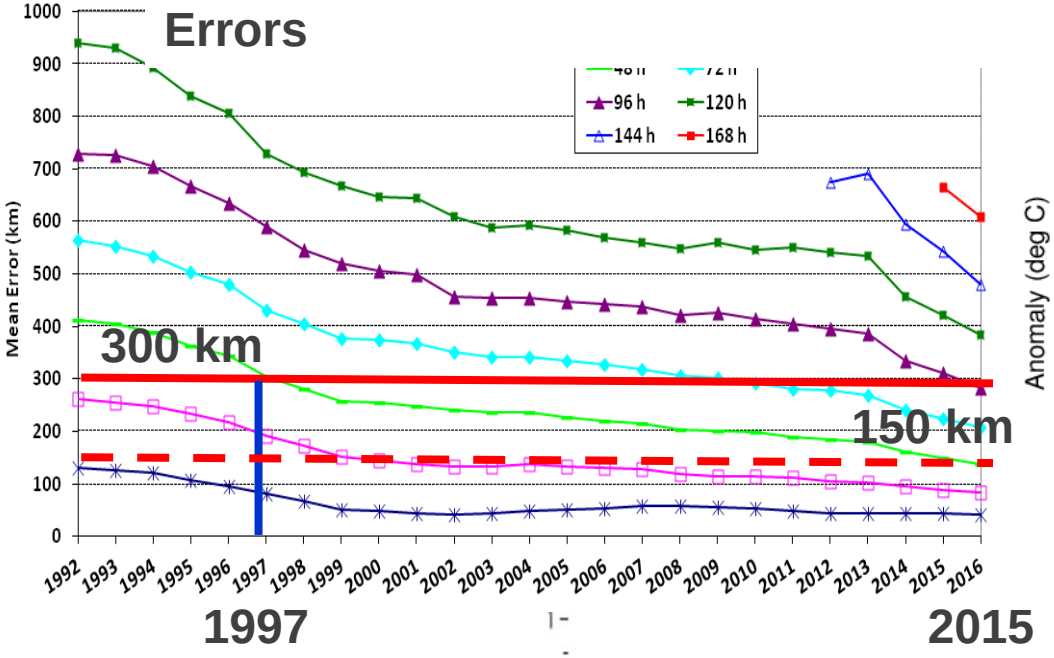
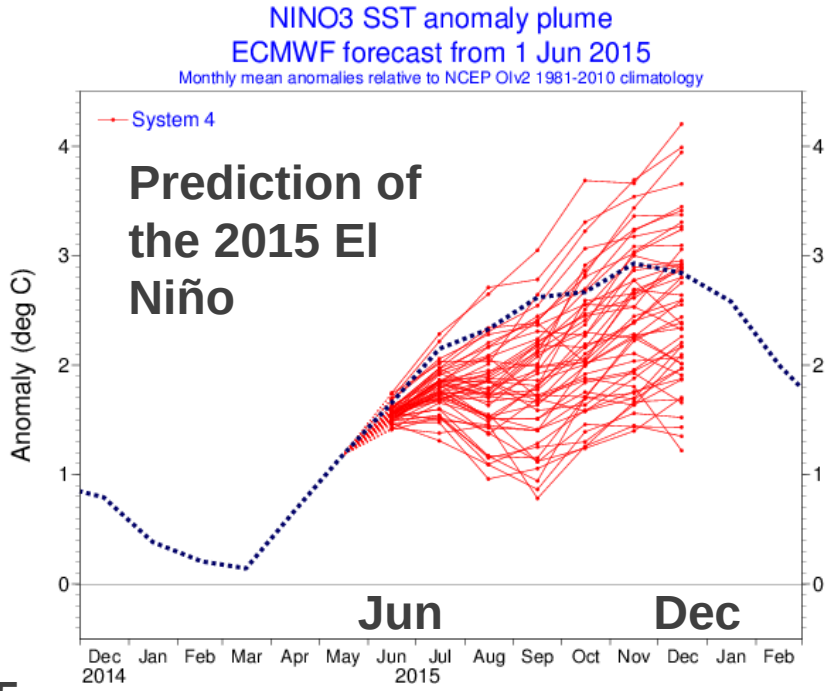
Statement by

JOHNNY CHAN
Chair Professor of Atmospheric Science
and the Director of the Guy Carpenter
Asia-Pacific Climate Impact Centre

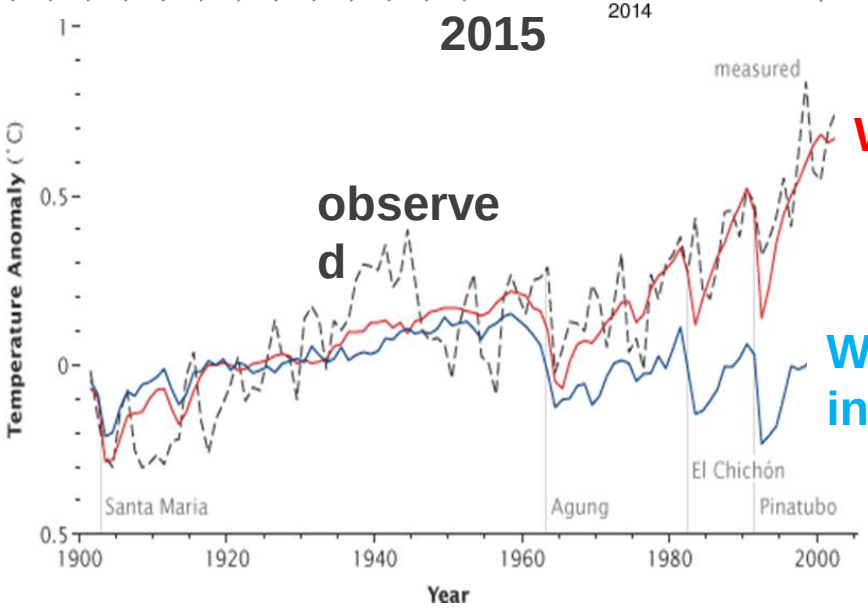
Northern Hemisphere Tropical Cyclone Track Forecast Position Errors





ECMWF

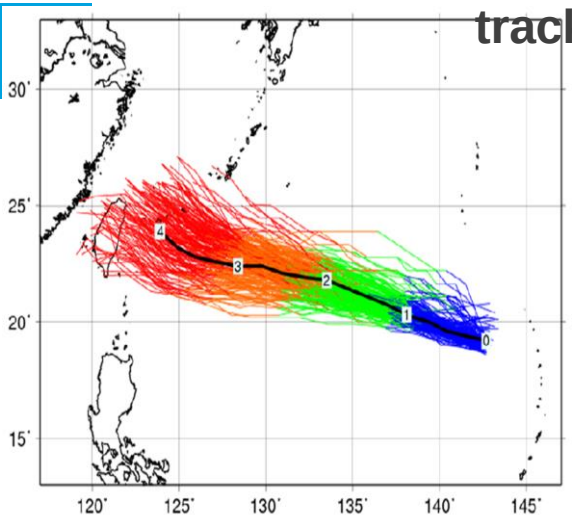
Simulation of global temperatures

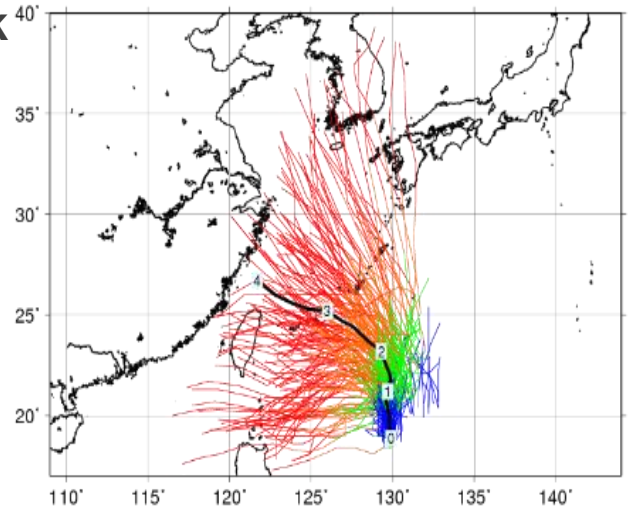


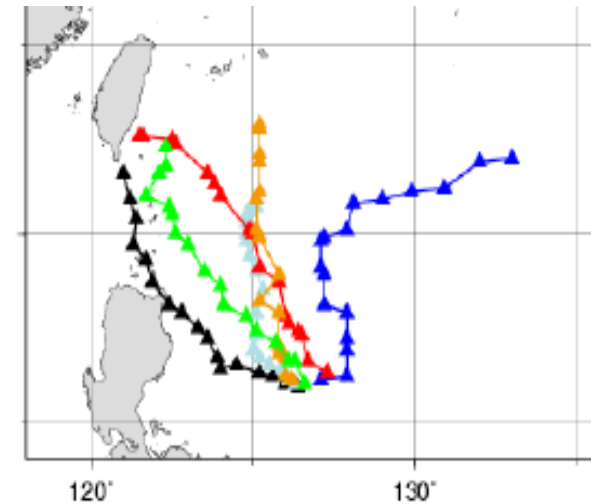
With human influence

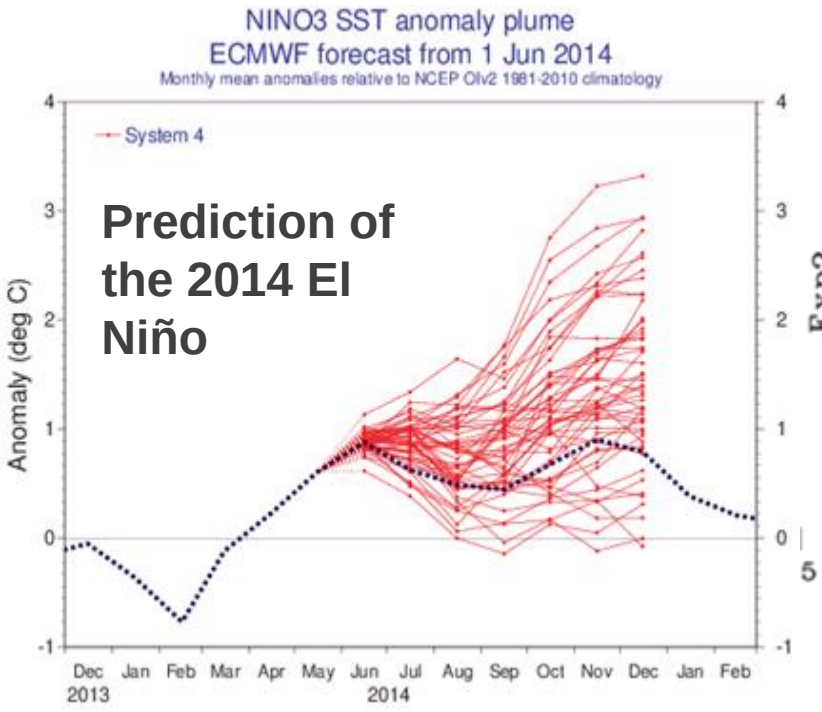
Without human influence

Ensemble prediction of tropical cyclone track



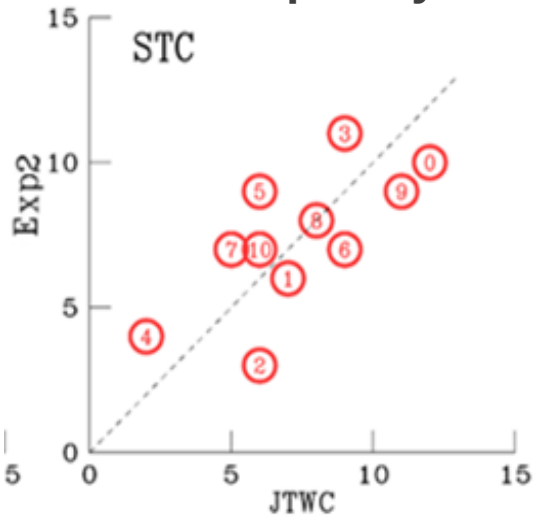




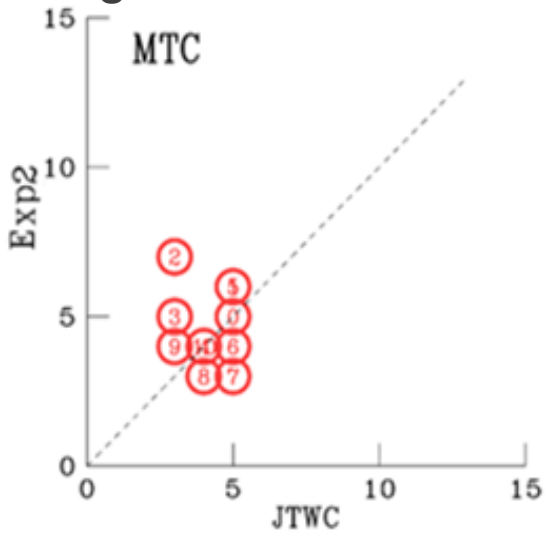


Prediction of the 2014 El Niño

Prediction of TC landfall frequency from a regional model



South China



Central China

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Statement by

LAWRENCE BUJA
Director Climate Science & Applications Program
National Center for Atmospheric Research in Boulder, Colorado

Climate Services: Research Opportunities & Challenges

Lawrence Buja – National Center for Atmospheric Research

Climate Services: "The timely production and delivery of useful climate data, information and knowledge (**with**) decision makers" NRC, 2001 (modified)

"Give me trusted information enabling me to reduce the uncertainty of my business decisions. What does this mean in the next 1,10, 50 years?"

- Two-way interactions essential
- Jargon-free, clear, actionable,
- Expose and quantify the (un)certainties
- Greatest success working with well organized groups
- Emerging standard of practice for climate services

Goal: Actionable climate products and processes allowing planners to make major, climate-informed decisions

…and move ahead with their real job

….and stay out of court.

Climate Services: Research Opportunities & Challenges

Actionable science: Data, analyses, projections, or tools that can support decisions regarding the management of the risks and impacts of climate change. It is ideally co-produced by scientists and decision makers and creates rigorous and accessible products to meet the needs of stakeholders.

(ACCCNRS, 2015)

- Focus on risk across systems
- Shorter time-scale climate predictions -> MJO/NAO/etc
- Moving from static to co-developed specialized information services
- Open-source, community-developed, science-based tools
- International partnerships to coordinate national efforts
    - Science: WCRP/WWRP, Future Earth
    - Insurance: Climatewise (UK), OASIS
- Climate 3.0

Coffee & Tea

We will continue at 16:15

Panel 4

Role of Risk Modelling as an enabler to stimulate new sovereign and regional risk transfer

Panel 4

MODERATOR
MAMIKO YOKOI-ARAI
Principal Administrator
Organisation of Economic Co-operation & Development (OECD)

ALANNA SIMPSON
Senior Disaster Risk Management Specialist
World Bank's Global Facility for Disaster Reduction and Recovery

GARY MCINALLY
Chief Actuary
Flood Re

ANDREW MASTERS
Senior Insurance and Risk Advisor
UK Department for International Development

GERRY LEMCKE
Head of Business Development of Global Partnerships
Swiss Re

KIRSTEN DUNLOP
CEO
Climate KIC

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Statement by

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How will risk modelling shape the future of risk transfer?

SCOR SE Headquarters

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Contribution by

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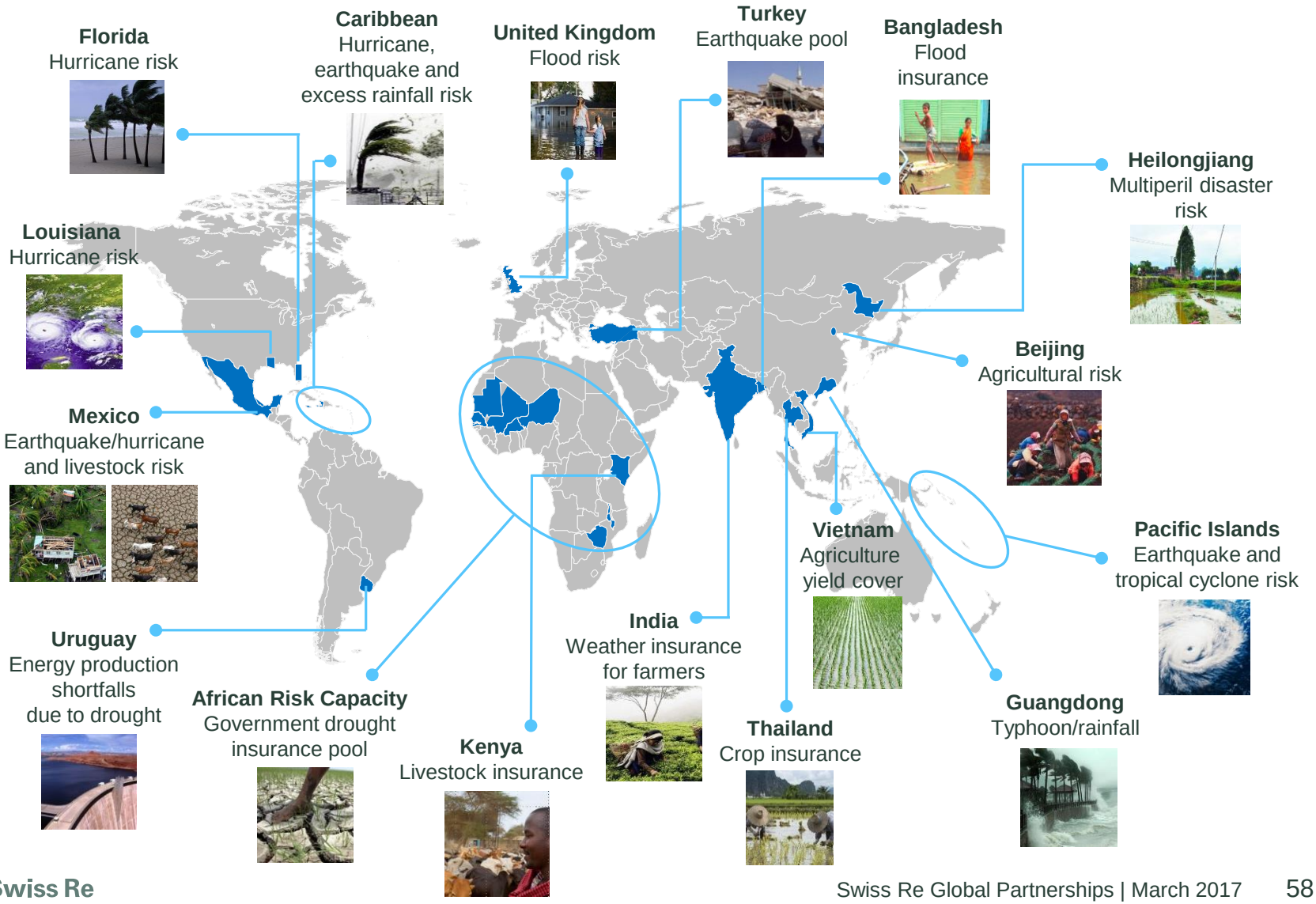
Swiss Re

Examples of innovative risk transfer solutions for the public sector



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