



DLR Knowledge For Tomorrow

DLR contributions to face Global Challenges

Prof. Dr. Pascale Ehrenfreund

Vienna, 18. February 2016

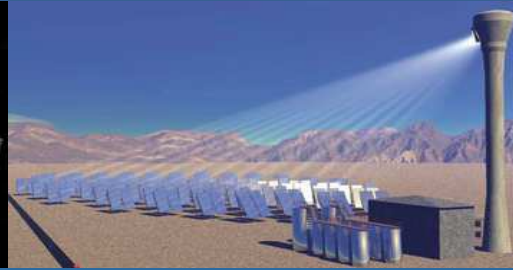
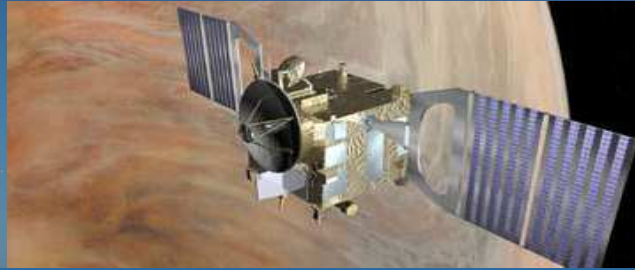


Aeronautics

Space

Energy

Transport



Research Center



Space Administration



Project Management Agency



Missions

Science

Services

Technology

Safety & Security

Outreach



Sites & Facilities

~ 8.000 Employees

33 institutes & facilities spread over
16 sites across Germany

Field stations in O'Higgins
(Antarctica), Inuvik (Canada) &
Almeria (Spain)

Offices in Berlin, Brussels, Paris,
Washington D.C. & Tokio





Global Challenges: Solutions from SPACE

TerraSAR-X & TanDEM-X

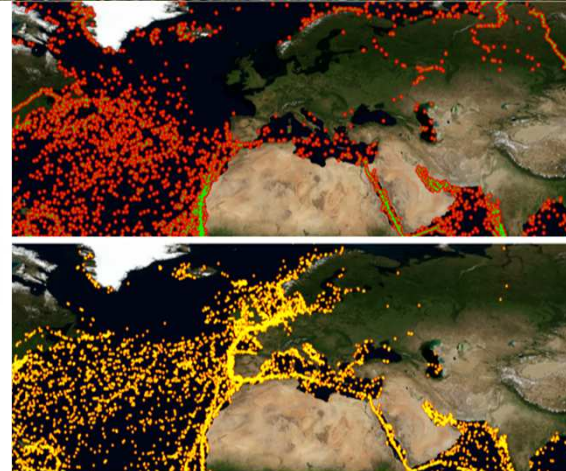


UNITED NATIONS
Office for Outer Space Affairs
UN-SPIDER
www.un-spider.org



Space-based information for disaster
management and emergency response

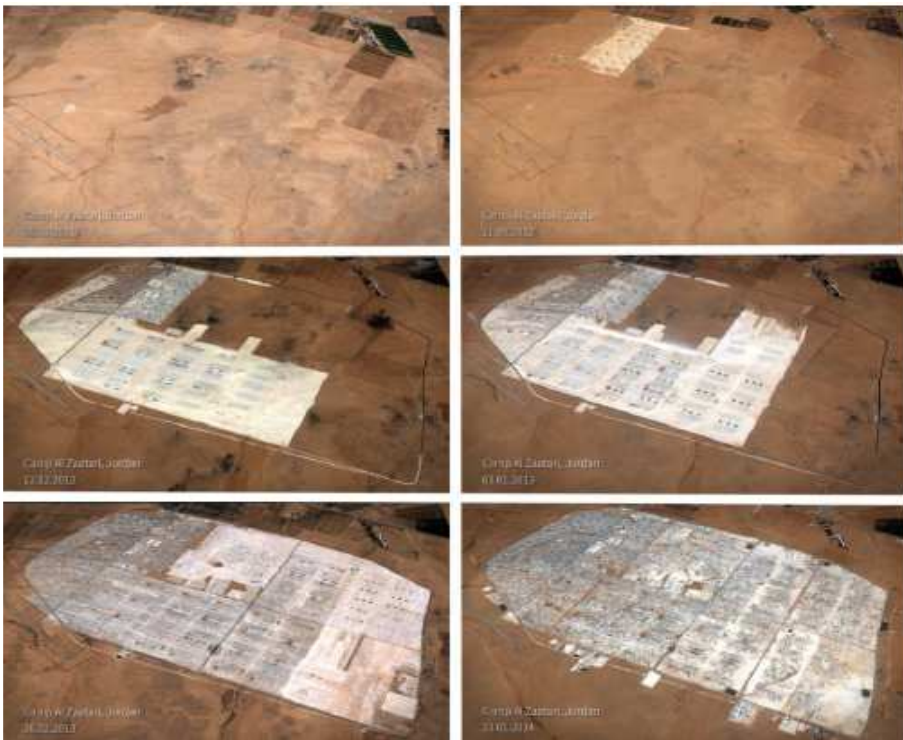
Photo Credits: NASA/DLR





Migration

**DLR Center for Satellite Based Crisis Information (ZKI)
Emergency Mapping & Disaster Monitoring**



UNITED NATIONS
Office for Outer Space Affairs

UN-SPIDER

www.un-spider.org

**United Nations Platform:
Space-based Information for
Disaster Management and
Emergency Response**

**United Nations Office
for Outer Space Affairs (UNOOSA)**

Supported by Satellite Observations



Photo Credits: NASA/DLR

**International Charter
For Space and
Major Disasters**

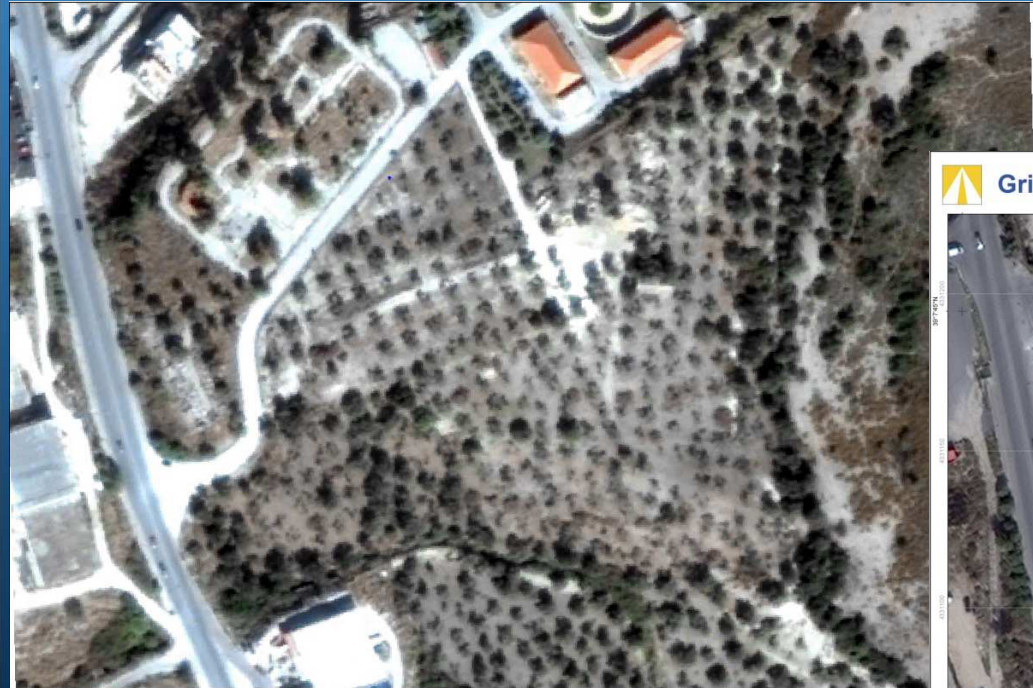


**AISat
Automatic Identification
System Satelliten**



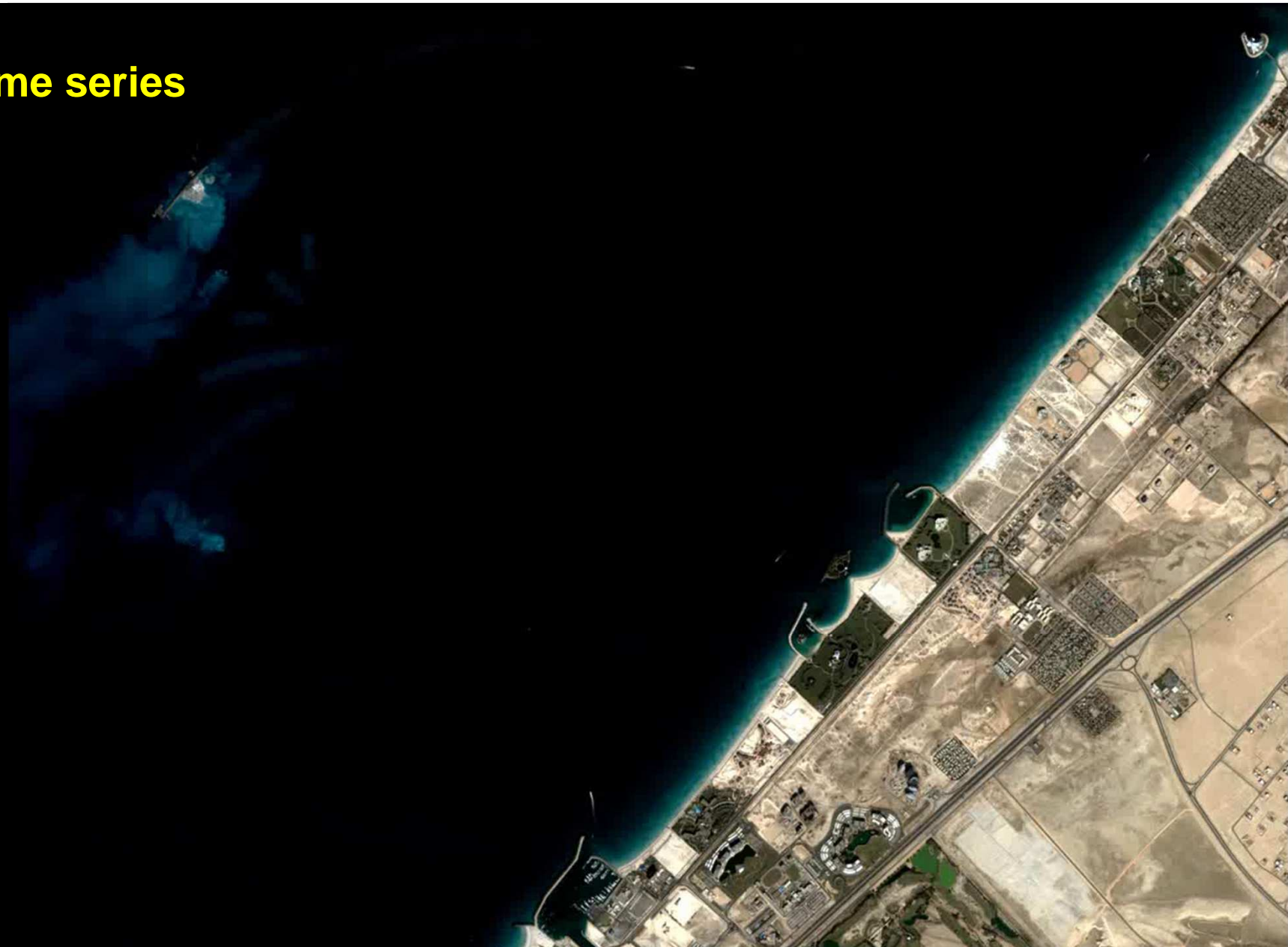
Monitoring of Refugee Camps – EU Hot Spot island

Kara Tepe Refugee Camp on Lesbos Island, Greece 2. November 2015



High-resolution time series

2003-2005



Yellow River Delta/China 1984



Yellow River Delta/China 1995



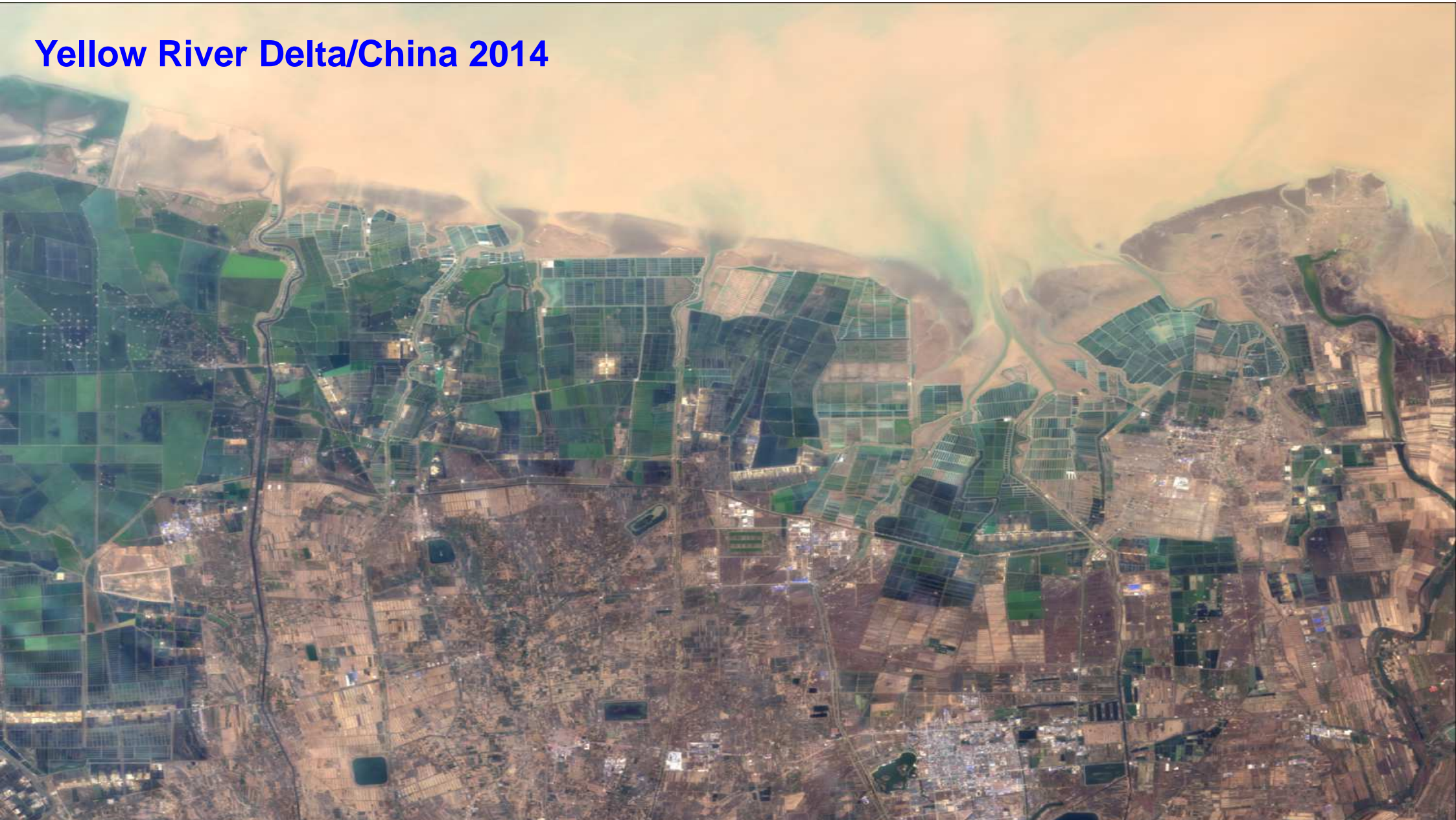
Yellow River Delta/China 2004



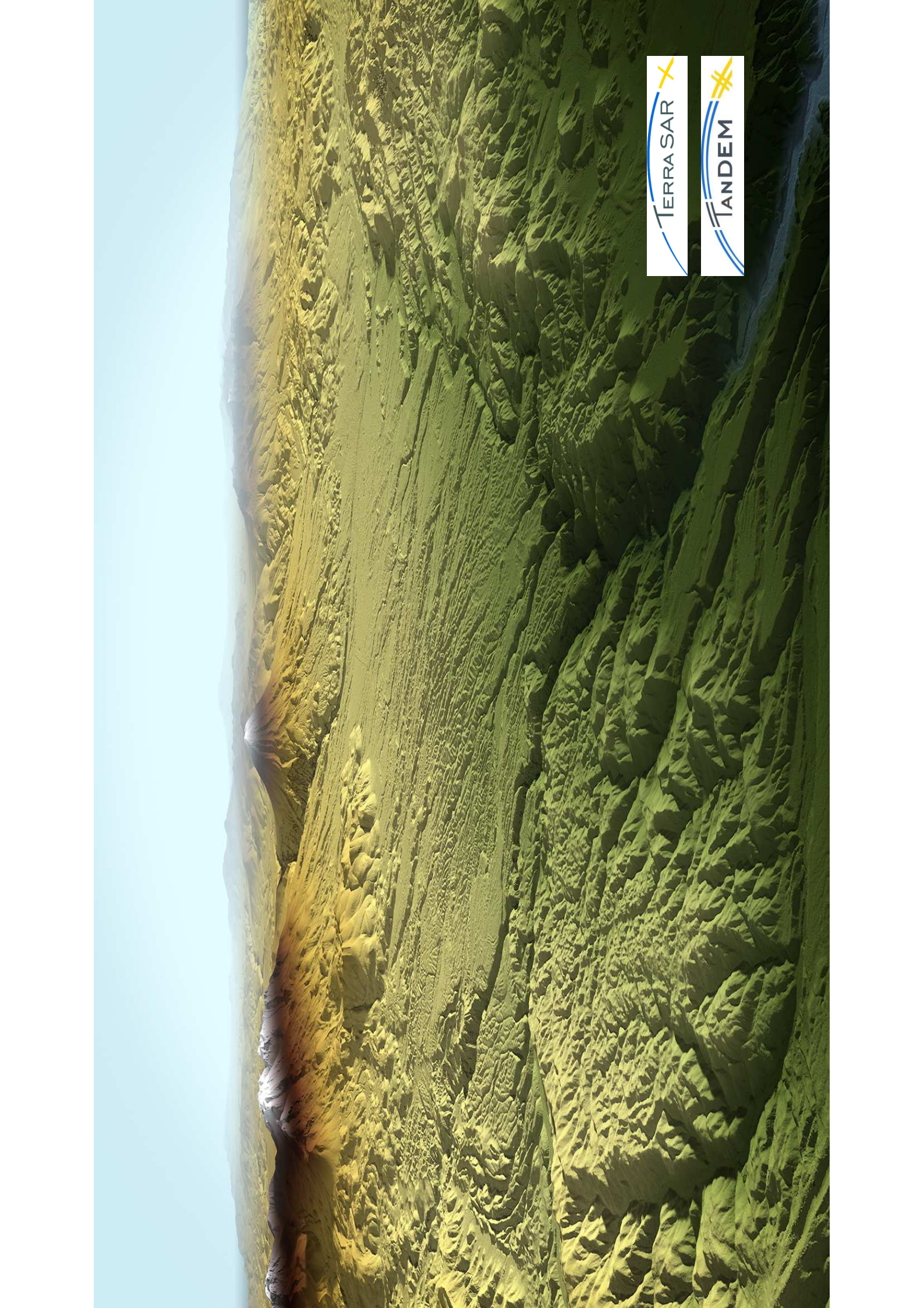
Yellow River Delta/China 2014

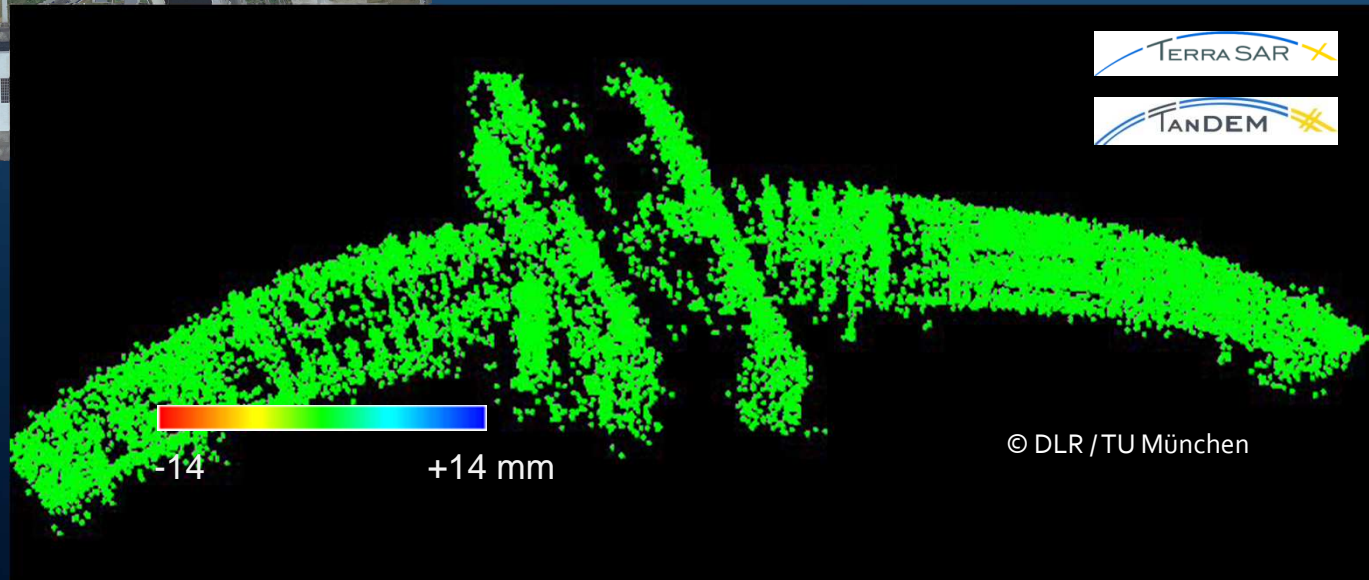


Yellow River Delta/China 2014









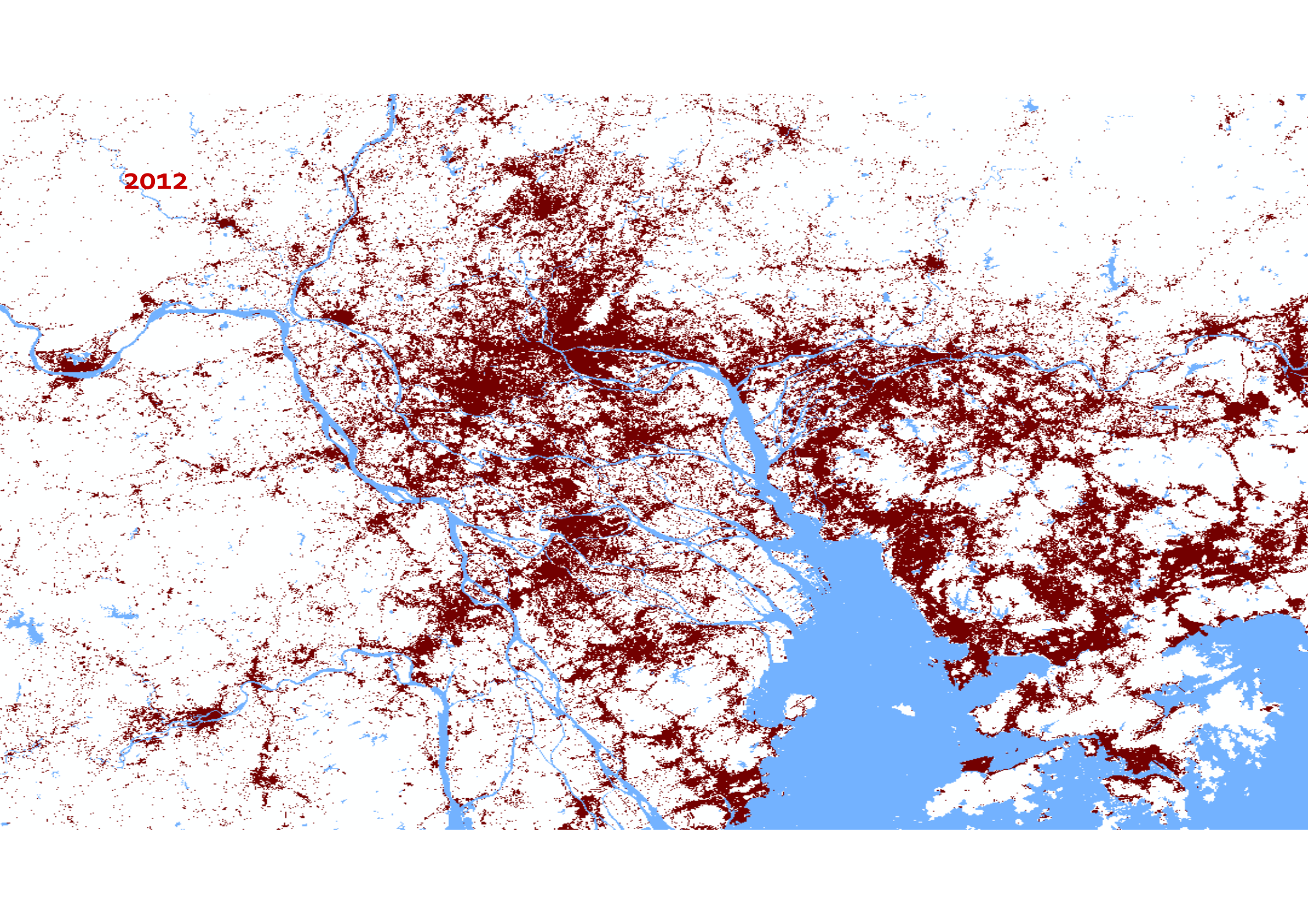
© DLR / TU München



Monitoring of Urban Areas



15 km





Arctic ice fields 1980-2010





30 TSX images: Oct. 2007 – Oct. 2008

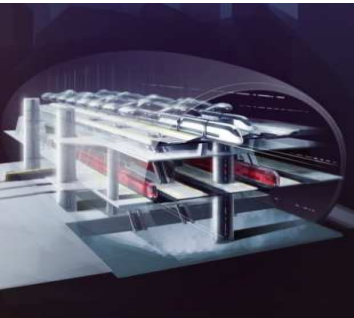


Climate protection Aeronautics




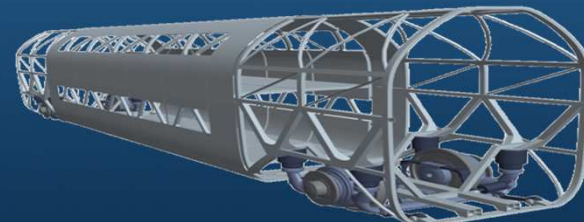
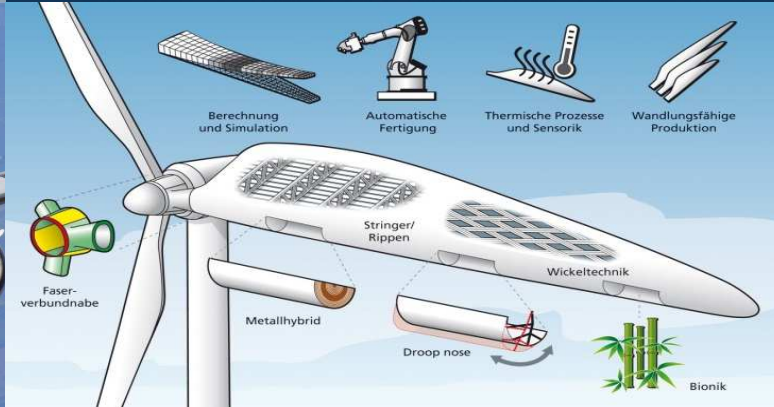
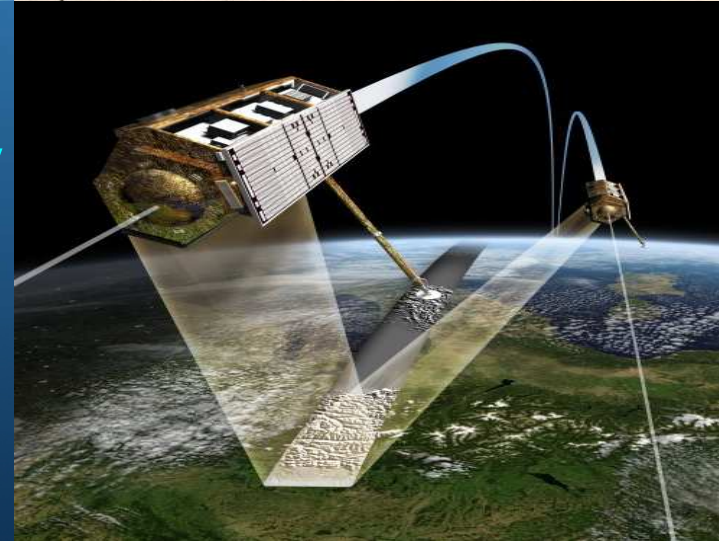
HALO

Amazonasgebiet



Synergies

Aeronautics, Space, Energy and Transportation



DLR contributions to COP 21 goals

Global analysis and holistic system analysis for a better environment

➡ **Monitoring climate change agreements from space**

Identifying and realising synergies at the interfaces of DLRs research

➡ **New impulses for contributing to societal needs**





Space provides indispensable contributions to cope with global challenges

DLR provides

Unique synergies of 5 research areas, space administration and project management agency

Innovative research from basic research to product development

Reliable partner for politics, industry and society!





Knowledge For Tomorrow

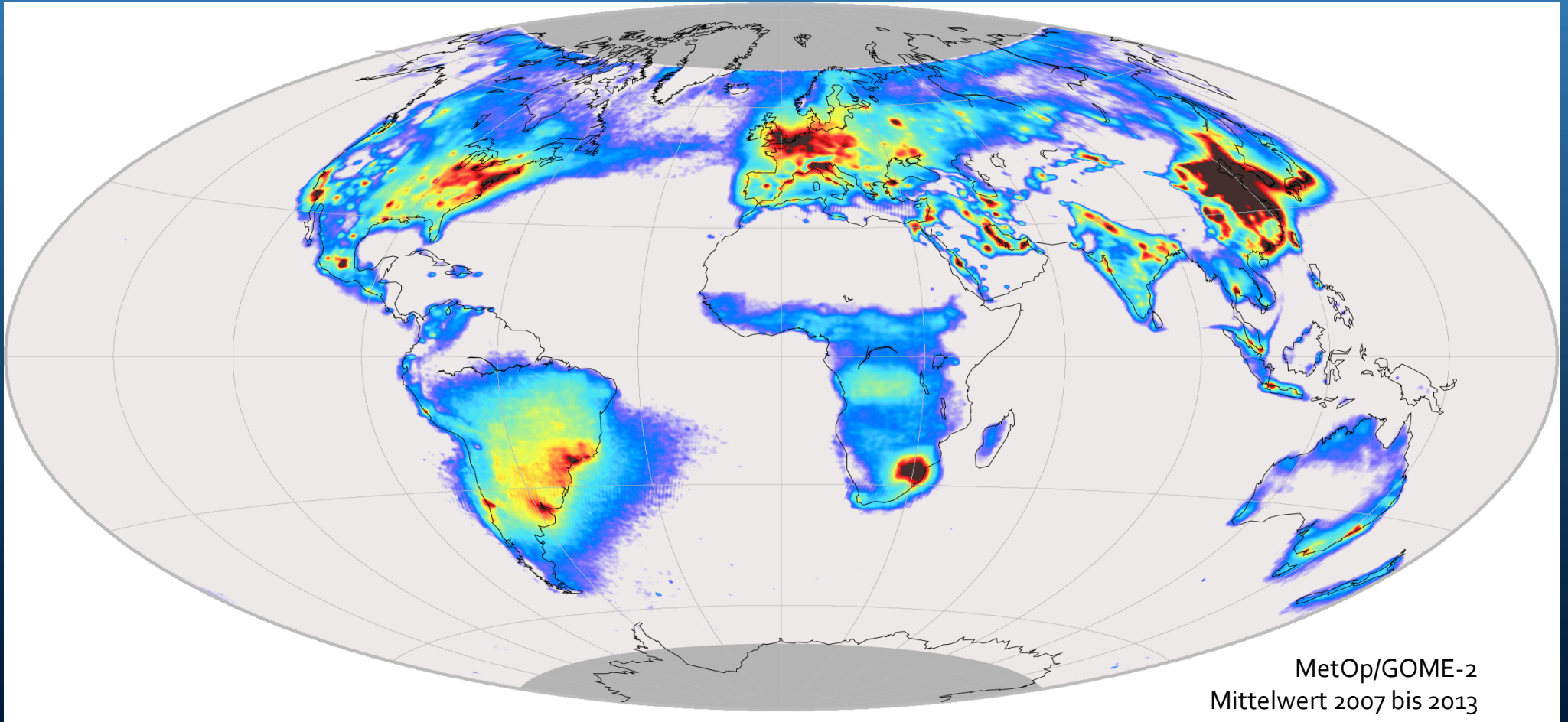
Thank you!

Contact:

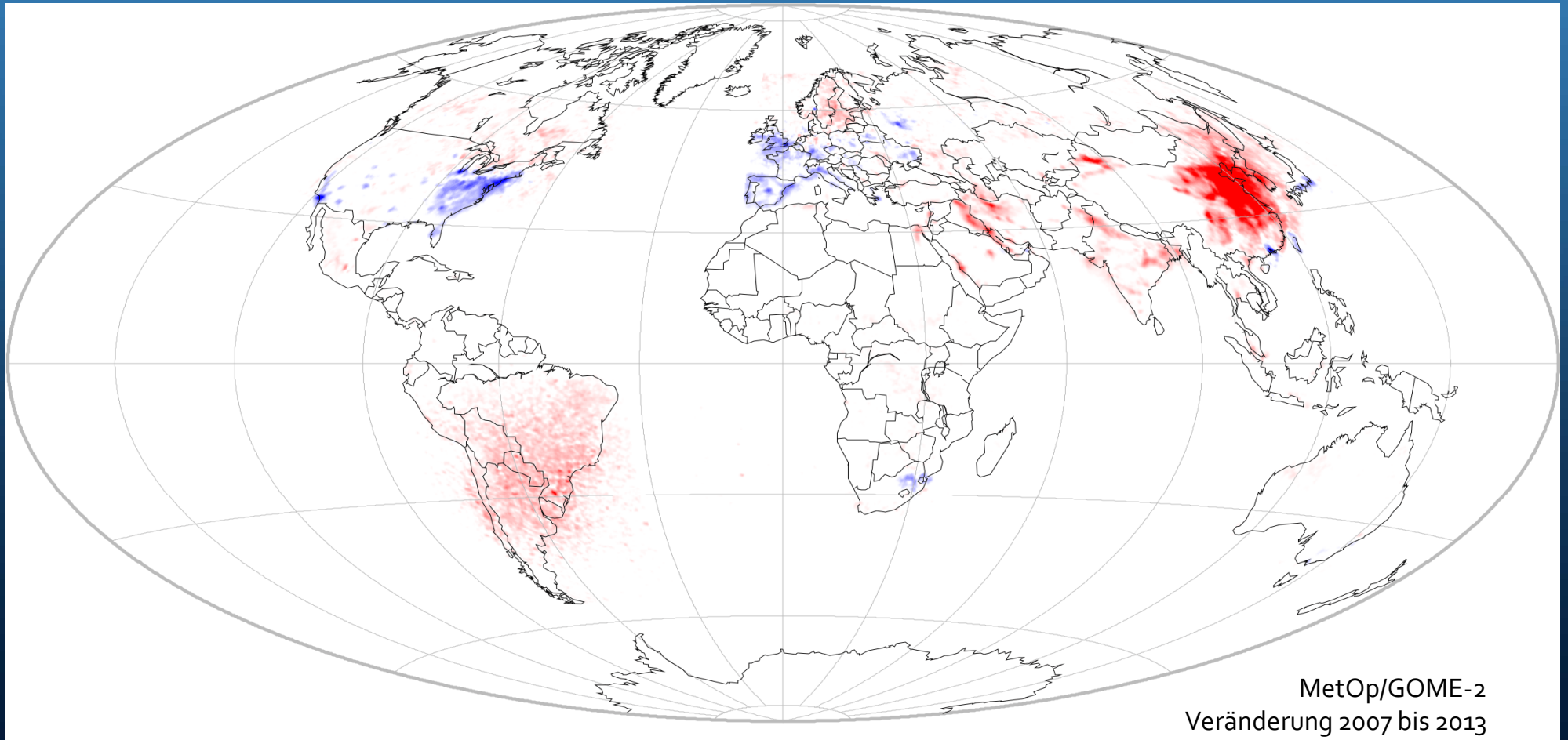
pascale.ehrenfreund@dlr.de



Global Monitoring of NO₂ Emission



Global Monitoring of NO₂ Emission Changes

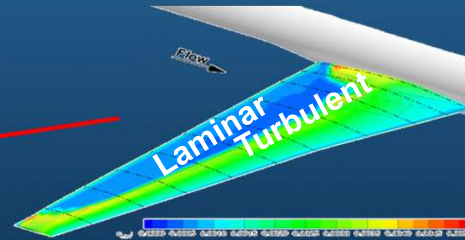
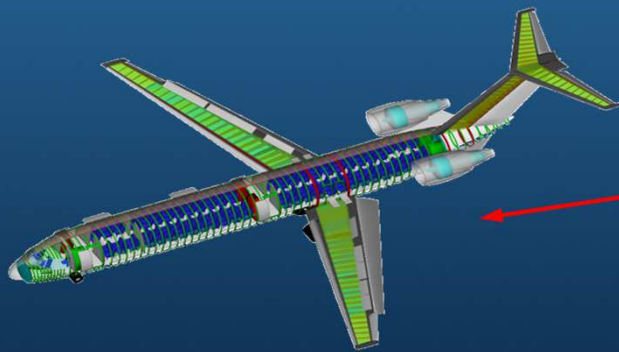




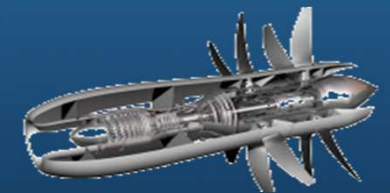
Contributions to the mitigation of climate change impacts

Research for the reduction of fuel consumption and less greenhouse gas production (CO₂, NO_x, ...) via

- Technologies for more efficient aircrafts,
- More efficient procedures in air traffic management



Reduce Resistance !!!



More efficient propulsion !!!

Quantification and assessment of the impact of contrails on the generation of climate relevant cirruses





Early Warning for Natural Hazards e.g. Tsunami



Matching #8

Created: 2014-04-01T23:46:47Z

based on Observation(s)

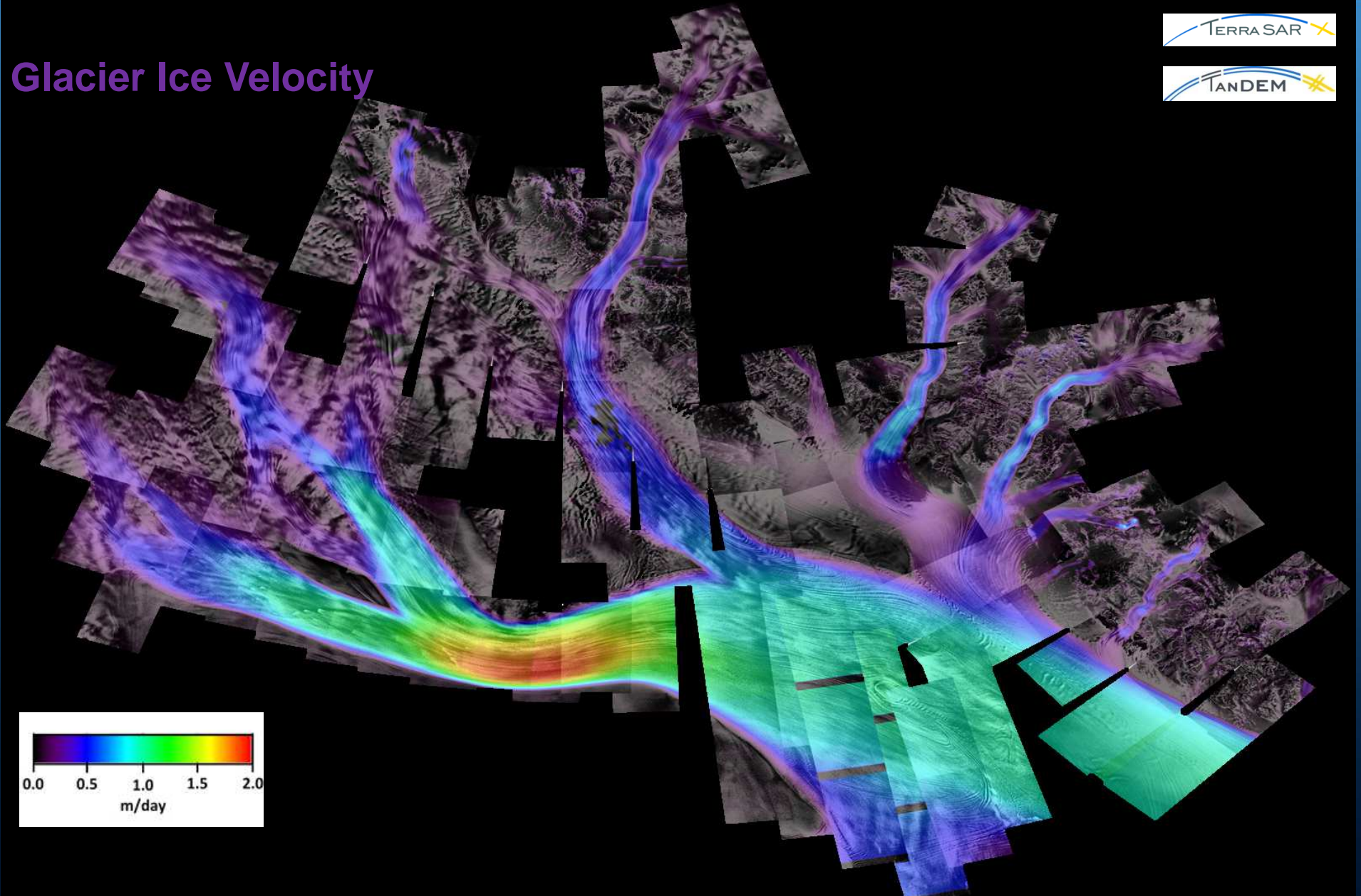
ID	Date/Time (UTC)	Mag	Lon	Lat	Depth
8	2014-04-01T23:46:47Z	8.2	-70.78	-19.61	25 km

Scenario

Scenario ID: r2012_m030_mw8_00_dep020_n0022_10h

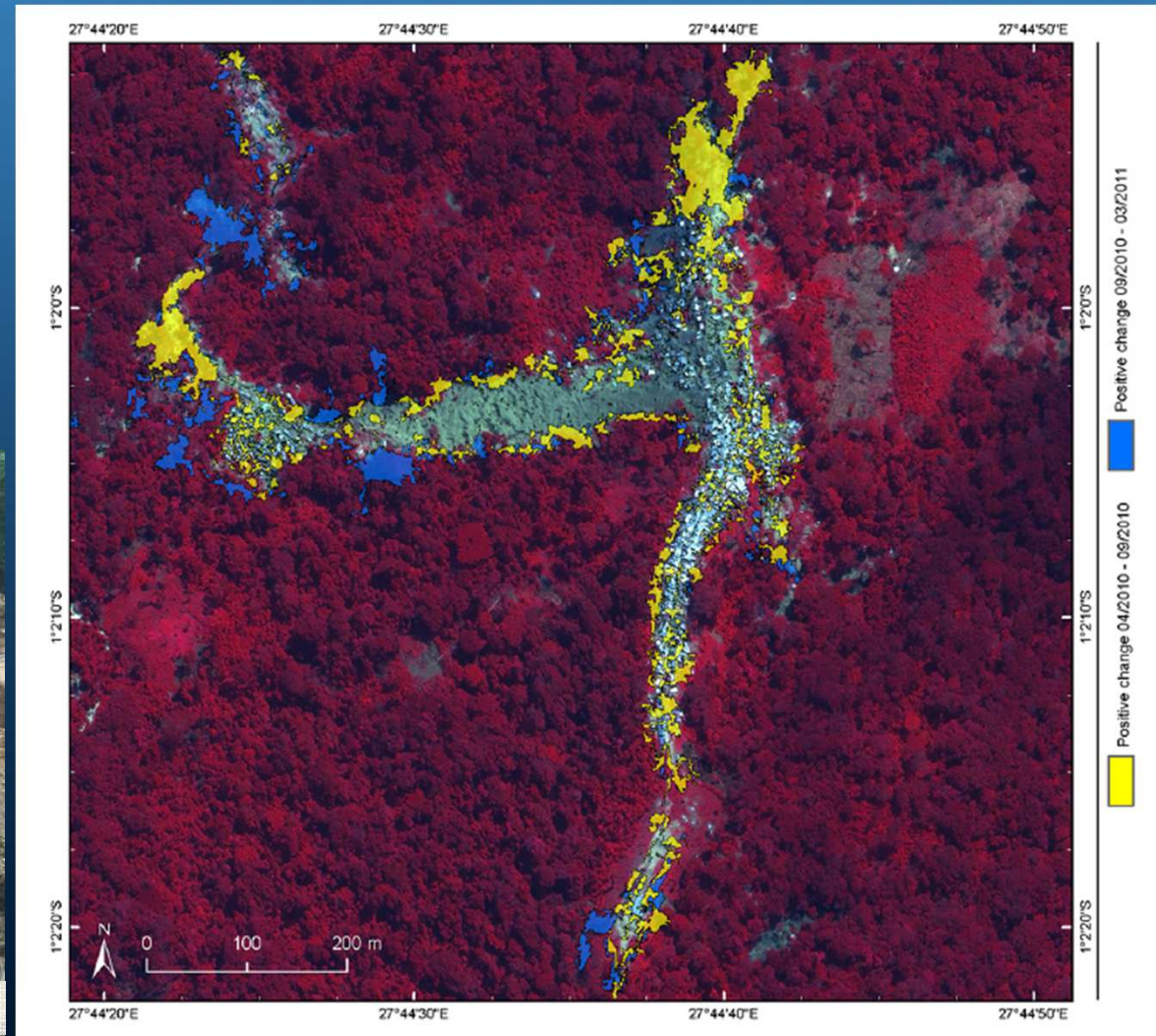
Region	maxWH	medianWH	minETA
XV Region Arica y Parinacota	1.3 m		
I Region de Tarapaca	0.2 m		
II Region de Antofagasta			
Archipelago Juan Fernandez			
VIII Region del Biobio			
San Felix			
VI Region de Valparaiso			
Bernardo O'Higgins			
V Region de Los Andes			
III Region de Coquimbo			
IV Region de Atacama			
IX Region de la Araucania			
X Region de los Lagos			
XIV Region de Los Rios	0.2 m	0.1 m	

Glacier Ice Velocity



Monitoring of conflict regions

- Detection of mining areas
- Identification and spatio-temporal analyses
- Detection of new infrastructure as well as the environmental impact



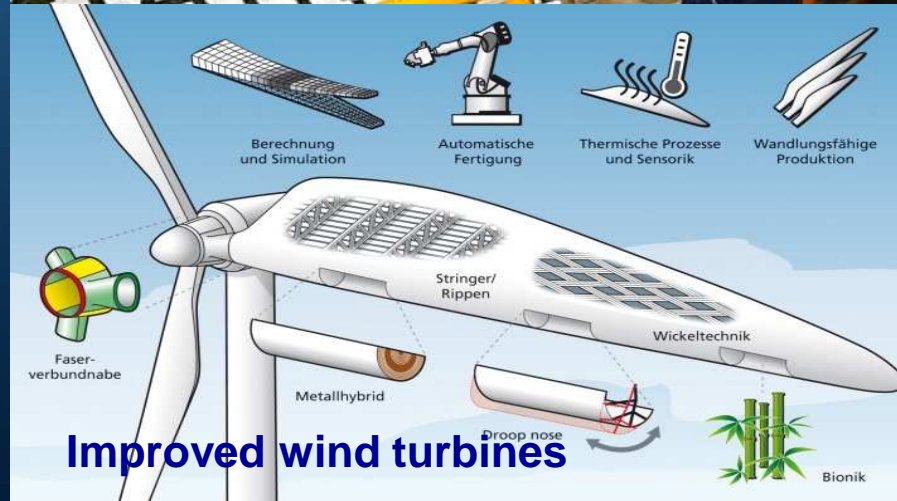
Climate Protection through DLR Energy Research



Concentrating solar power



Renewable resource maps



Improved wind turbines

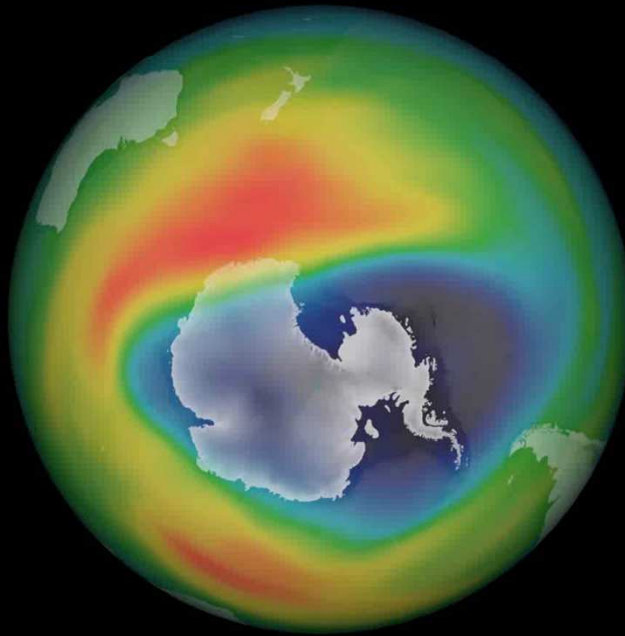


Chemical storage

Using synergies with space, aeronautics and transport research

Ozone Monitoring

GOME-2 / MetOp
ANALYSED TOTAL
OZONE COLUMN
10-11-2015

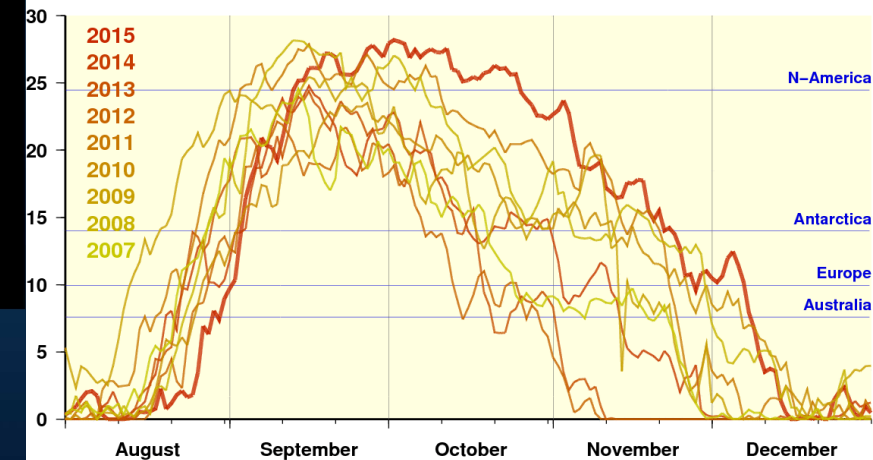


Dobson Units
[DU]



DLR – Earth Observation Center (EOC)

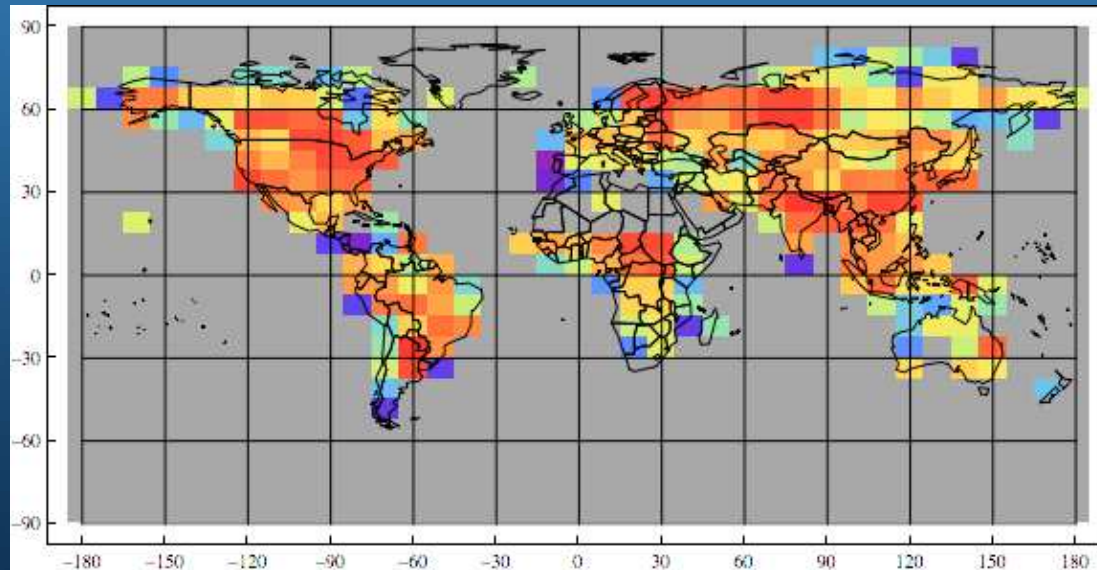
Ozone Hole: Area [10^6 km^2]



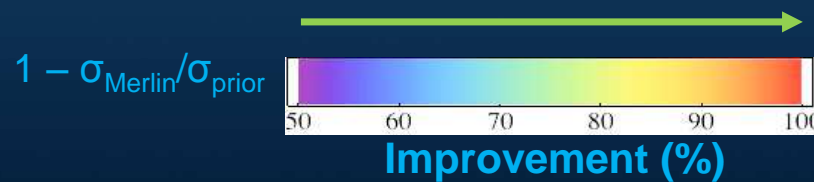


Methane Lidar Mission - MERLIN

CH₄ Flux Knowledge Improvement



M. Heimann, J.
Marshall, MPI-BGC,
Jena; C.Kiemle, DLR
Oberpfaffenhofen,
Germany



MERLIN



D. Ducros, CNES





Our Strengths

Unique Synergies

between
Five Research Areas
Space Administration &
Project Management Agency

Innovative Science

from basic research
to product development

Reliable Partner

for
Politics
Industry &
Society





2014



Senat

33 Members from Science, Industry & Political Institutions

Executive Board

**Space
Administration**

1.083 Mio. €



**Research
&
Development**

871 Mio. €



HELMHOLTZ
| ASSOCIATION

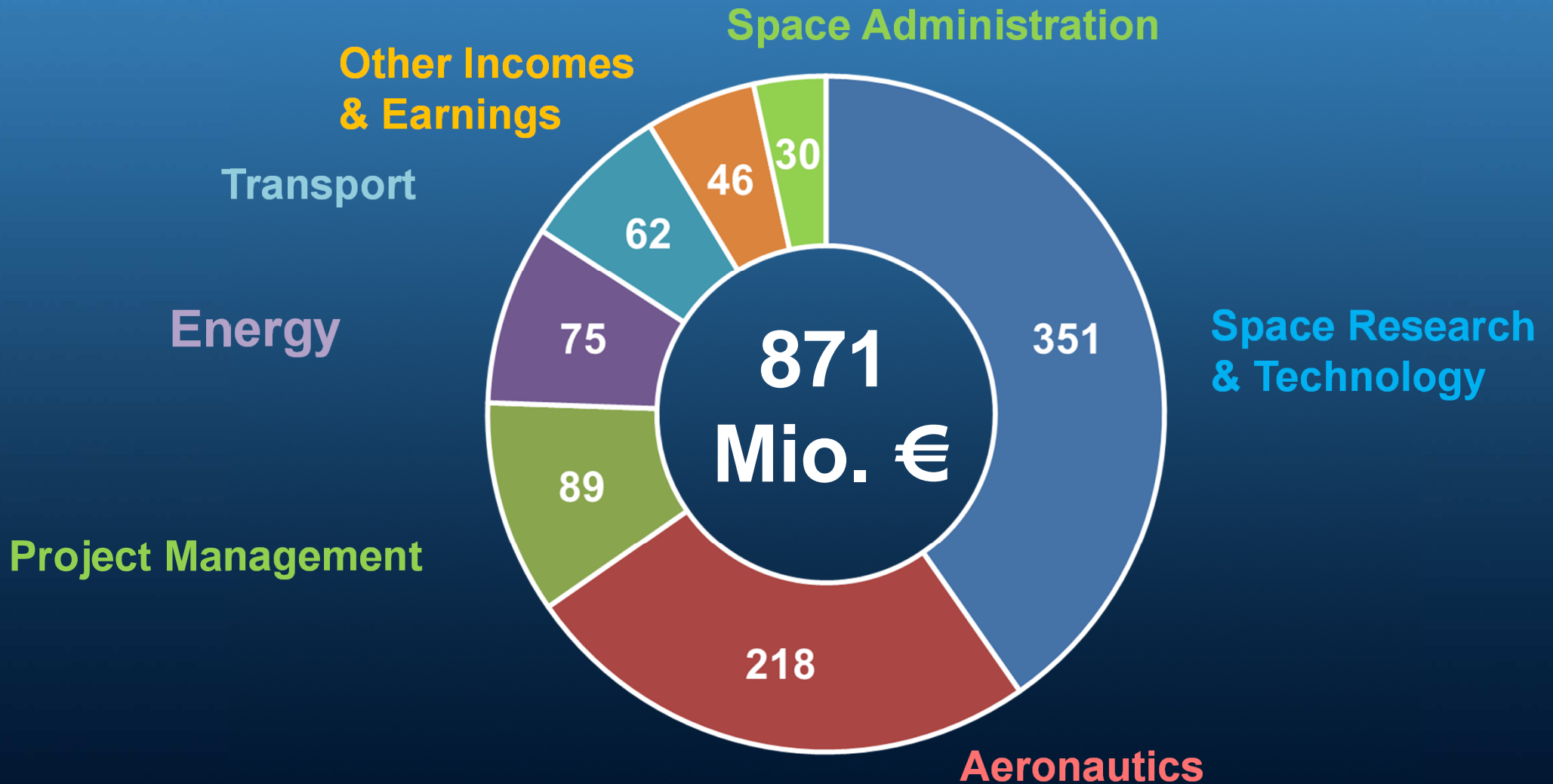
**Project
Management
Agency**

1.225 Mio. €





Research, Operations & Management 2014





Third-Party Funds 2014

Other External
Incomes & Earnings

Foreign
Commercial
Enterprises

Supernational
Organisations

German
Commercial
Enterprises

Foreign
Governmental
Organisations

German
Governmental
Organisations





-80% CO₂ until 2050



Intelligent Mobility



Safety & Security

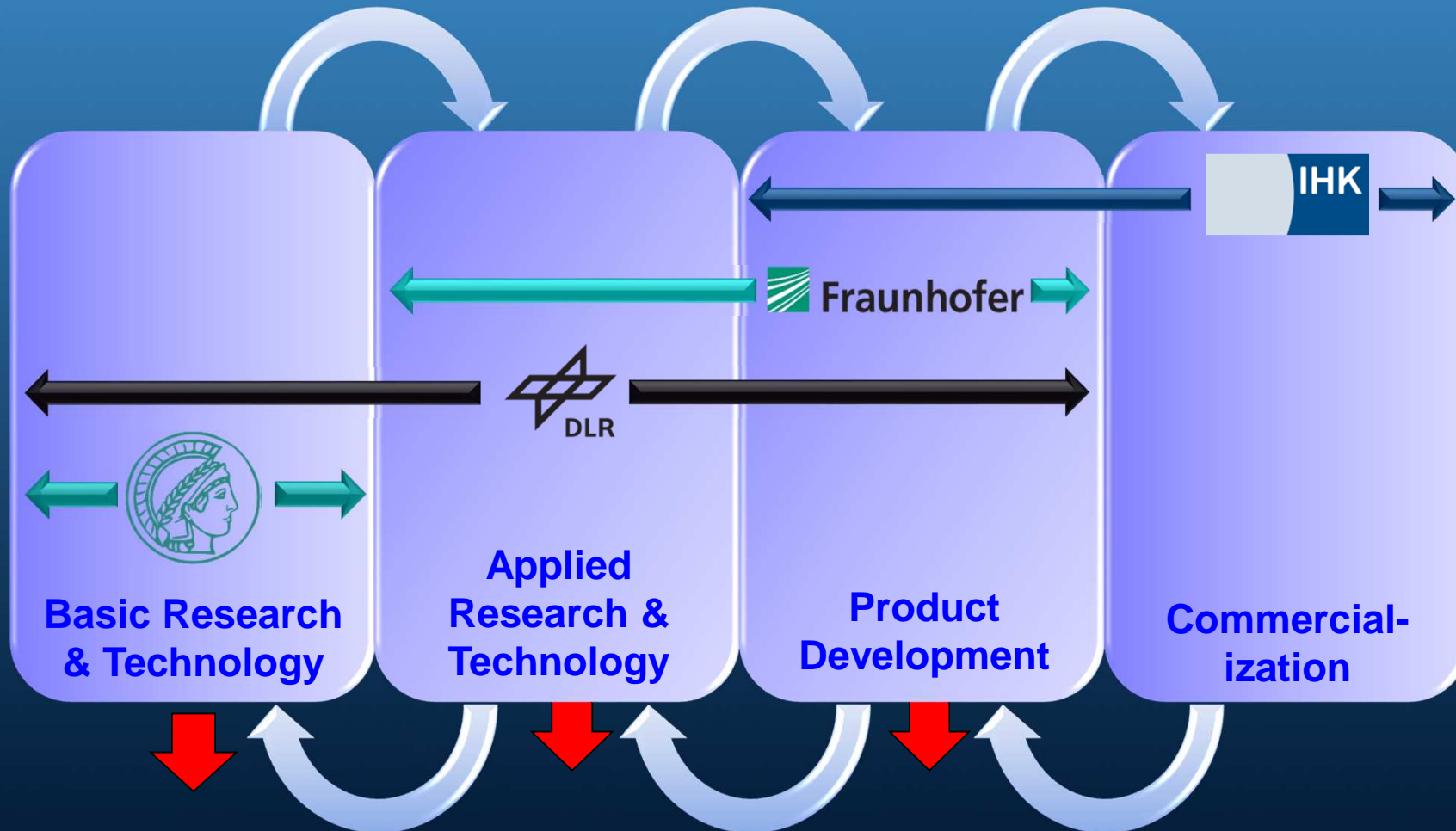


60% renewable Energy until 2050

Global Challenges



The Innovation Chain in Germany



Innovation-Ecosystem DLR

Strategic Guidelines

Global Challenges



Partner of the Industry

Technology
Innovation
Industrial Policy

Excellent Science

Education
Research-Infrastructure
Cutting-Edge Science



The Executive Board



Chair

**Pascale
Ehrenfreund**

Vice-Chair

**Klaus
Hamacher**

**Space
Administration**

**Gerd
Gruppe**

Aeronautics

**Rolf
Henke**

Space Flight

**Hansjörg
Dittus**

**Energy &
Transport**

**Karsten
Lemmer**

Reliable Partner for Politics, Industry & Society!