Fernerkundungsaktivitäten in der Bayerischen Forstverwaltung

Rudolf Seitz **LWF,** Leiter der Abteilung 1 Informationstechnologie

Arbeitskreis Fernerkundung der Deutschen Gesellschaft für Geographie (DGfG)
24./25. September 2015, Geozentrum Bonn

LWF

DLR Deutsches Zentrum für Luft- und Raumfahrt

BOKU Universität für Bodenkultur Wien
University of Natural Resources and Life Sciences, Vienna

BAYERISCHE FORSTVERWALTUNG

ZENTRUM WALD FORST HOLZ WEIHENSTEPHAN

Wald in Bayern

2,6 Mio ha Waldfläche (36,3 % der Landesfläche Bayerns)

70 % Privat (ca. 700.000 Eigentümer), Kommunal, Bund;
30 % Staatswald

Baumartenverteilung:

46 % Fichte
18 % Kiefer
16 % Buche
5 % Eiche
2 % Tanne
4 % sonstige Nadelbäume
9 % sonstige Laubbäume

Staatliche Akteure:

BAYERISCHE FORSTVERWALTUNG

Hoheit, Beratung, Waldpädagogik u.v.m

BAYERISCHE STAATSFORSTEN
Nachhaltig Wirtschaften.

AöR; Bewirtschaftung des Staatswaldes

LWF

Bayerische Landesanstalt für Wald und Forstwirtschaft LWF

Stabstelle und Ressortforschungseinrichtung des Bayerischen Staatsministeriums für Ernährung, Landwirtschaft und Forsten

Aufgaben:

- praxisnahe Ressortforschung rund um den Wald
- Bewältigung von Daueraufgaben (**B**undes**W**ald**I**nventur, **W**ald**K**lima**S**tationen, **K**ronen**Z**ustands**E**rhebung, **N**atur**W**ald**R**eservate)

8 Abteilungen, 2 Stabstellen

Ca. 180 MitarbeiterInnen

Aktuelle Fernerkundungsprojekte (Auswahl)

Projekte	Daten	Methoden	Ergebnisse	Kooperationen
Natura 2000	Digitale Luftbilder Laserscanning-Daten	Stereo-Luftbildinterpretation, GIS-Analysen, Klassifizierungsverfahren	**Waldstruktur**, Lebensraumtypenkarten	
SAPEX-DLB	Digitale Luftbilder Laserscanning-Daten	Modellierungs- und Klassifizierungsverfahren (z. B. Regression, Random Forest, K-Nearest-Neighbor, neuronale Netzeund Maximum-Likelihood)	Waldstruktur, **Ableitung forstlicher Kenngrößen aus Betriebsinventurdaten (BI)**	GEO CREATIV; BAYERISCHE STAATSFORSTEN
VitTree	HySpex-Daten WorldView-2 Daten Sentinel-2 Daten	Spektrale Zeitreihenanalyse	Vitalitätsveränderung	Universität für Bodenkultur Wien; ÖBf; Deutsches Zentrum für Luft- und Raumfahrt; BAYERISCHE STAATSFORSTEN
SAPEX-SAT	WorldView-2 Daten (Stereo)	Klassifizierungs- und Modellierungsverfahren	Ableitung forstlicher Kenngrößen aus Bundes Waldinventur (BWI) Daten, **Waldstruktur**	Universität für Bodenkultur Wien; ÖBf; Deutsches Zentrum für Luft- und Raumfahrt; BAYERISCHE STAATSFORSTEN
TreeIdent Fi/Kie	WorldView-2 Daten Landsat Daten	Klassifizierungs- und Modellierungsverfahren (z. B. Random Forest, K-Nearest-Neighbor und neuronale Netze)	Baumarten	Universität für Bodenkultur Wien; ÖBf; Deutsches Zentrum für Luft- und Raumfahrt; BAYERISCHE STAATSFORSTEN
EUS-FH	RapidEye Daten TerraSAR-X Daten	Spektrale Zeitreihenanalyse, parametrische Modellierung, objektbasierte Klassifizierung	Waldstruktur, **Ableitung forstlicher Kenngrößen aus BI-Daten**, Windwürfe	TUM Technische Universität München, Fachgebiet für Waldinventur und nachhaltige Nutzung; KIT Karlsruhe Institute of Technology
FastResponse	TerraSAR-X Daten Sentinel-1 Daten WorldView-2 Daten RapidEye Daten	ChangeDetection	Windwürfe	Universität für Bodenkultur Wien; ÖBf; Deutsches Zentrum für Luft- und Raumfahrt; BAYERISCHE STAATSFORSTEN

FastResponse - a system to support the forestal crisis management

Oliver Bauer, Department of Information Technologie, LWF
Kathrin Einzmann, Institute of Surveying, Remote Sensing and Land Information (IVFL), BOKU
Andreas Schmitt, German Remote Sensing Data Center, DLR
Andreas Hirner, German Remote Sensing Data Center, DLR
Rudolf Seitz, Department of Information Technologie, LWF

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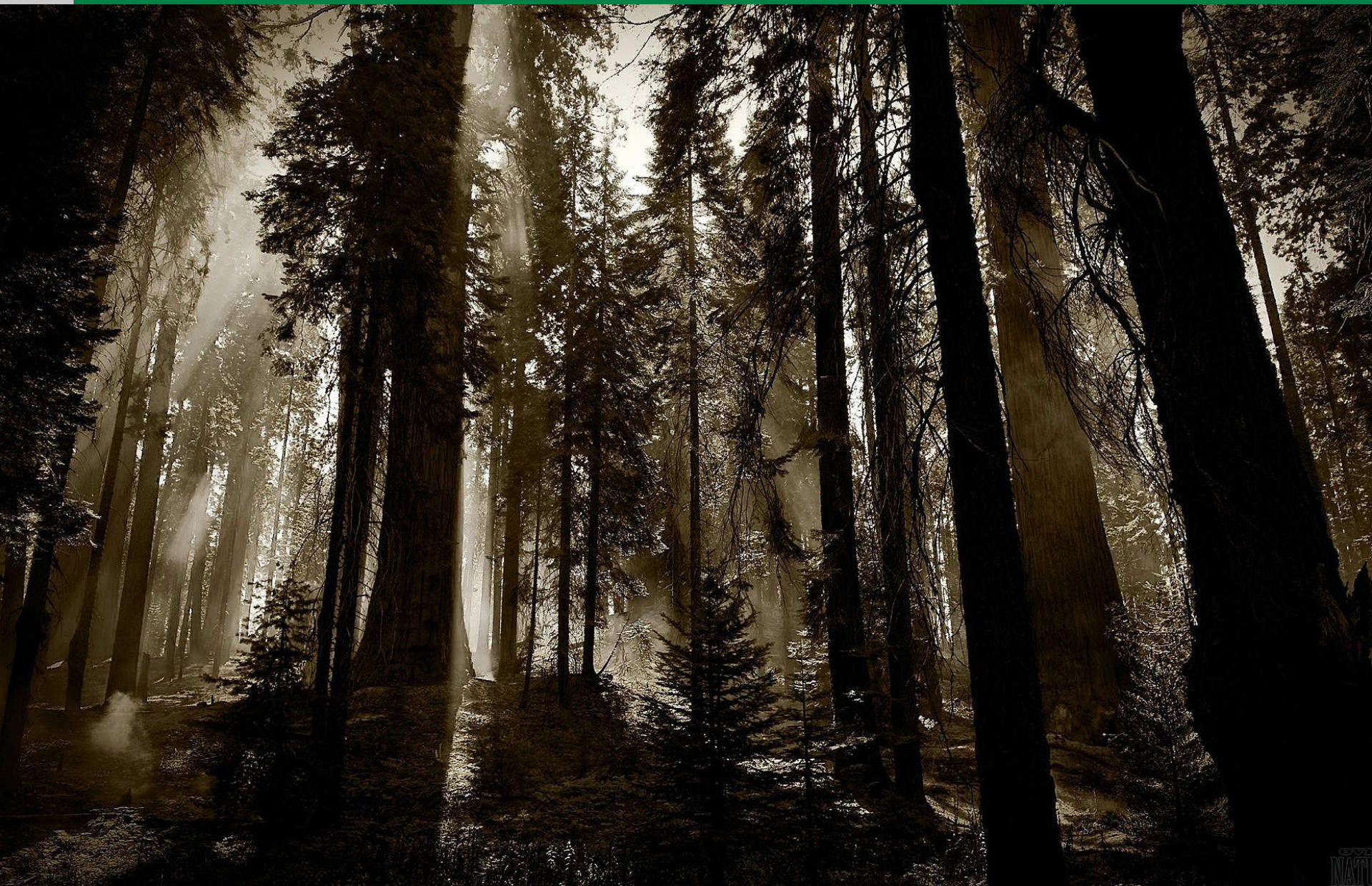
Nachhaltig Wirtschaften.

ÖSTERREICHISCHE BUNDESFORSTE

BAYERISCHE FORSTVERWALTUNG

ZENTRUM WALD FORST HOLZ
WEIHENSTEPHAN

Introduction



Introduction

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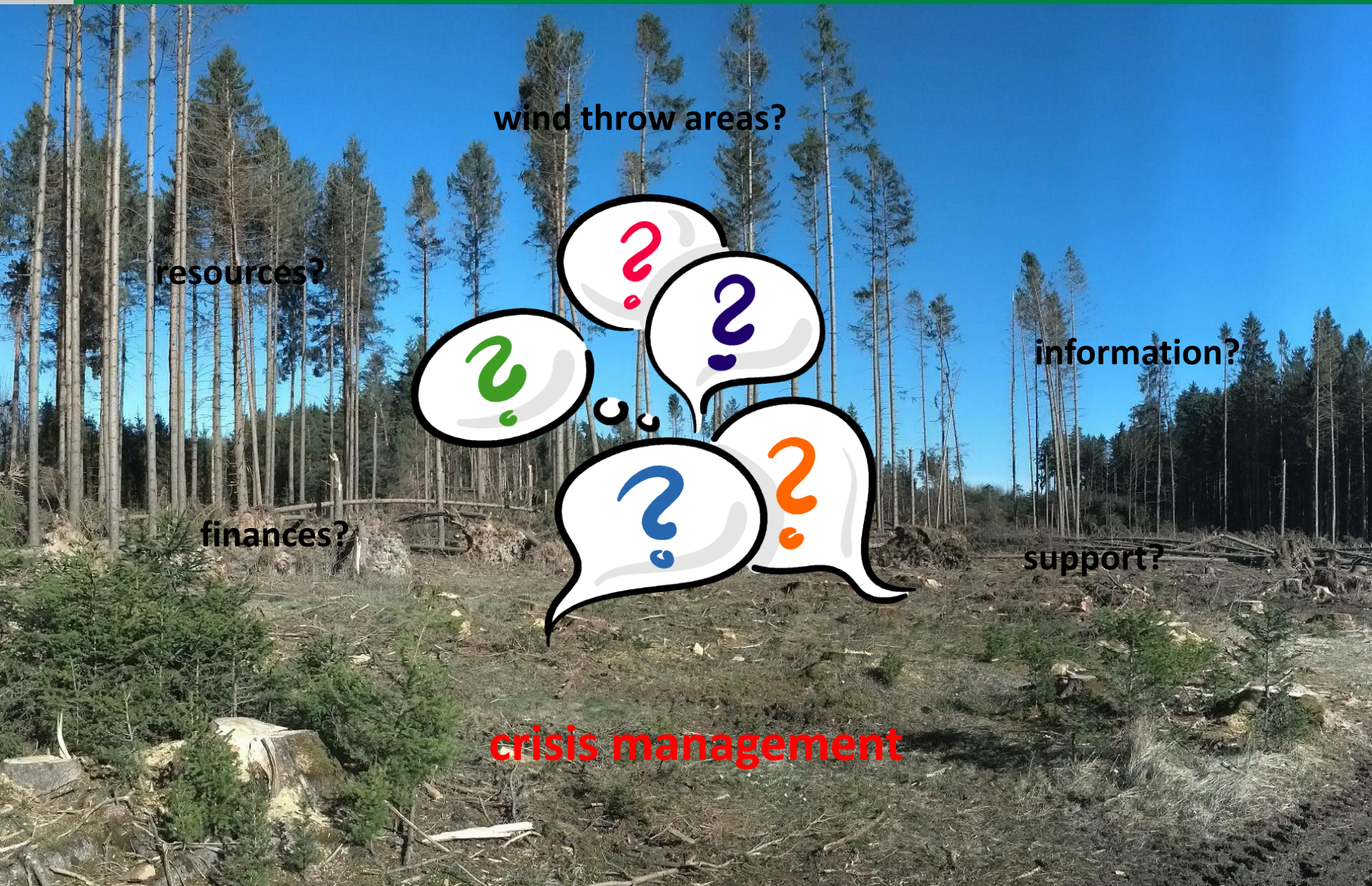

Motivation

There's a strong need of a concept…

- for an objective and detailed damage estimation
- to centralize and update information regularly after a storm event
- to avoid financial uncertainties for forest owners
- to minimize subsequent biotic damages (e.g. bark beetle)

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- for an objective and detailed damage estimation
- to centralize and update information regularly after a storm event
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…to support the crisis management in an efficient and fast way

OBJECTIVES

„FastResponse“

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Aim:

to allocate a **concept** which indicates actions how **to support** the crisis management of **windthrow areas** after heavy **storm events** with **remote sensing** techniques…

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„FastResponse“

Aim:

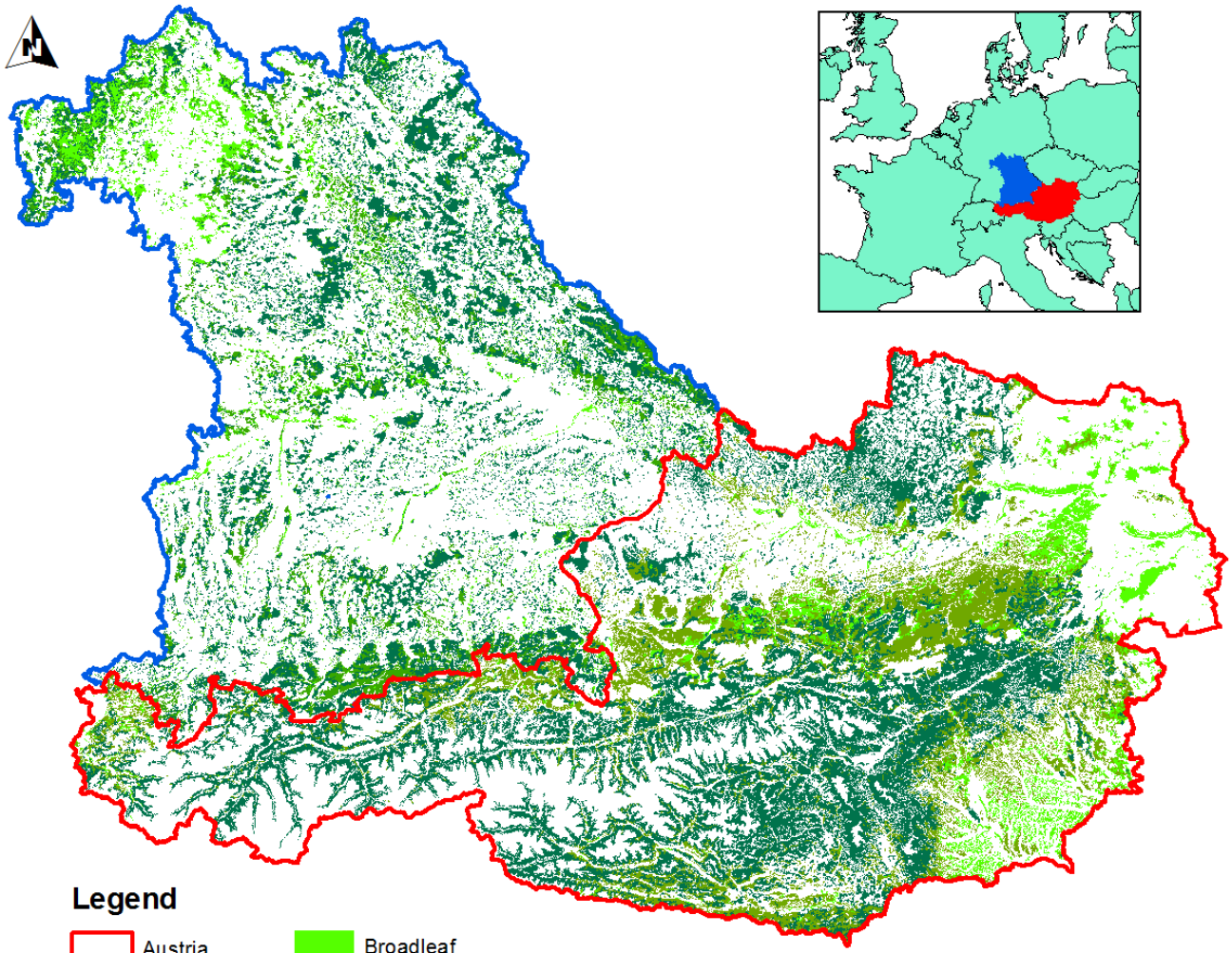
to allocate a **concept** which indicates actions how **to support** the crisis management of **windthrow areas** after heavy **storm events** with **remote sensing** techniques…

…which means

to establish a **process chain** in which **existing methods** and **available sensors** will be combined to a **operational, fast acting service**.

PRELIMINARIES

Region of interest



PRELIMINARIES

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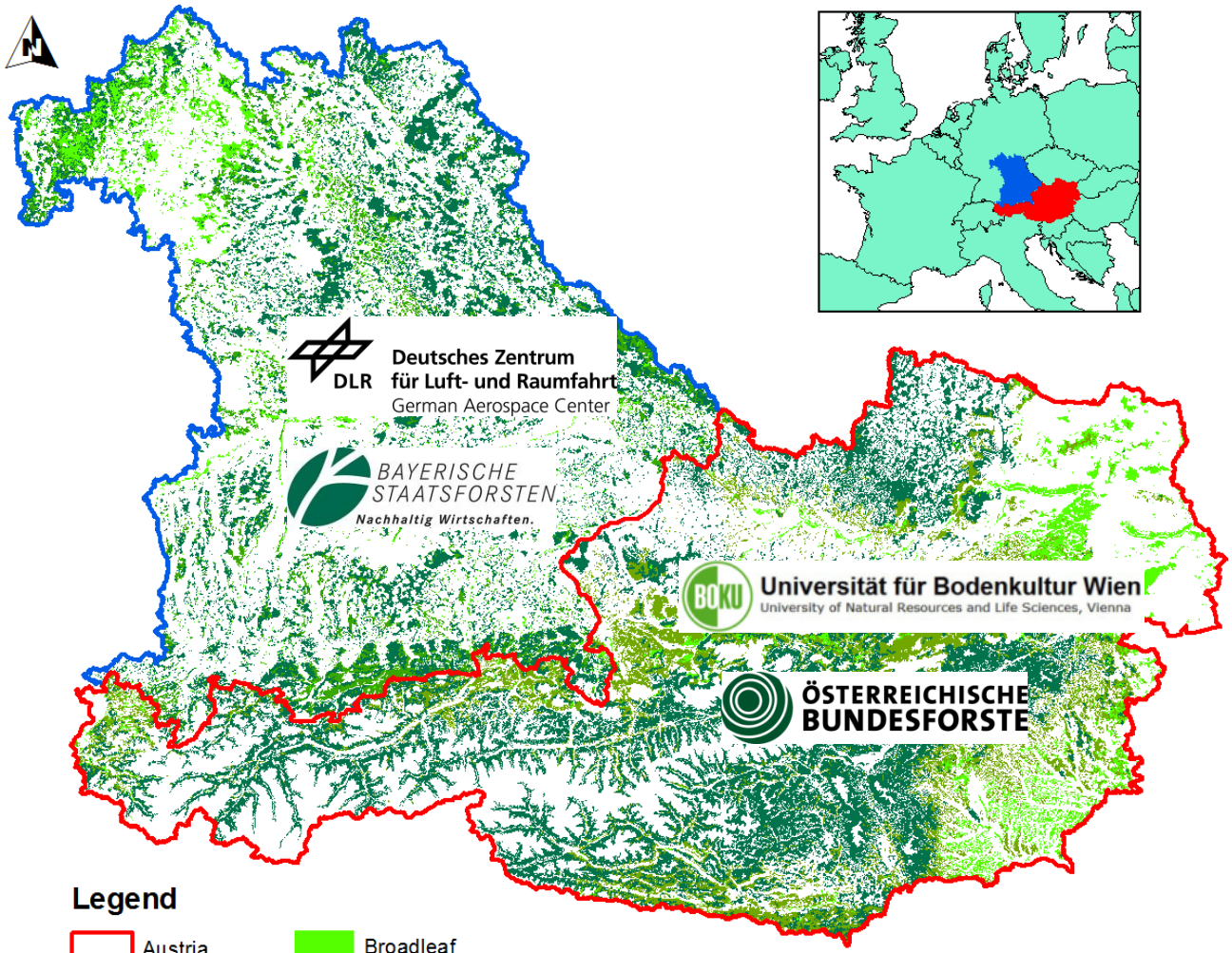


PRELIMINARIES

- Define user requirements
- Define user groups
- Define products
- Define system starting point

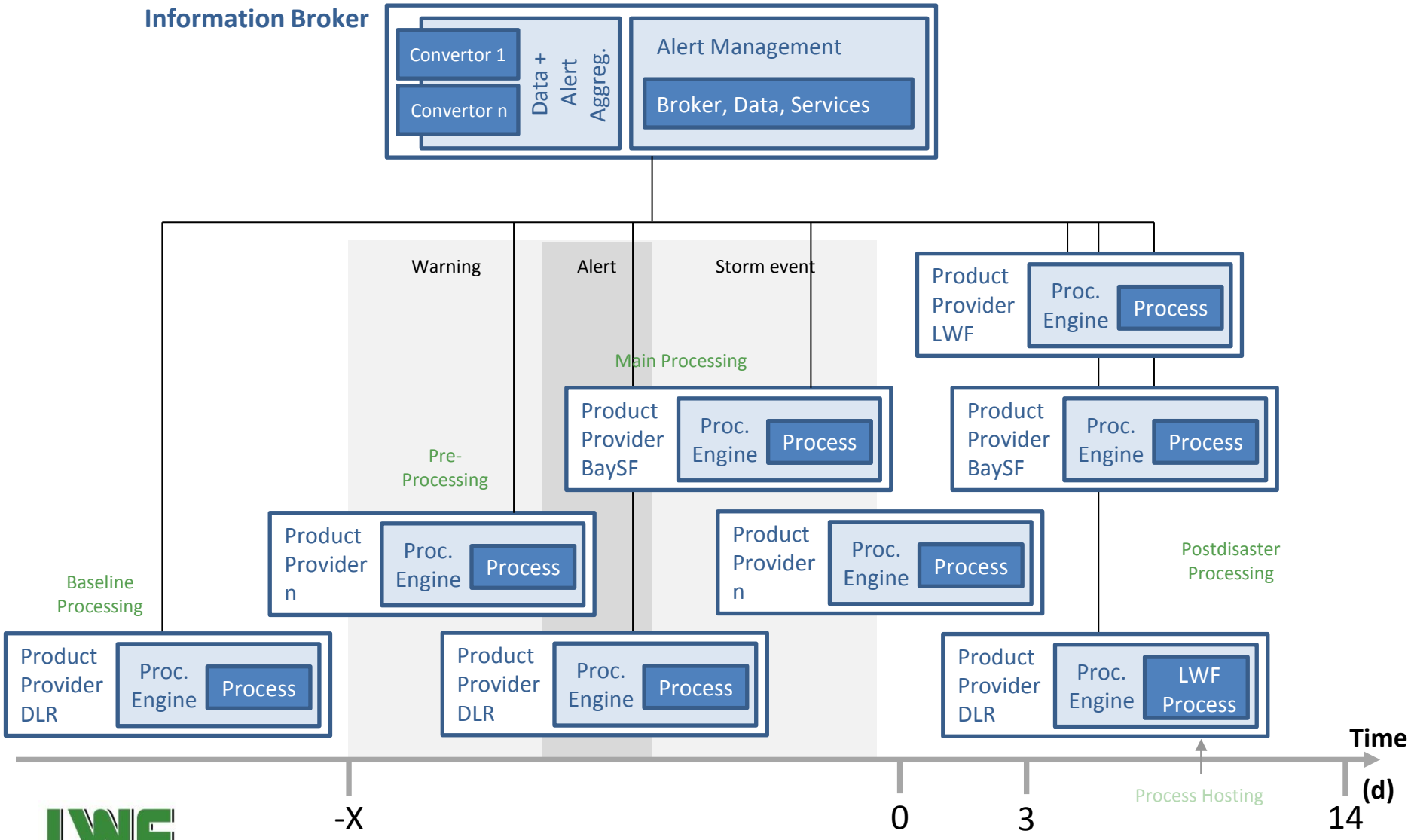
User requirements

…in a nutshell:

- size and location of wind throw areas (WTA) in forests
- identify all WTA >0.5 ha
- give additional information to the WTA (e.g. affected timer volume, accessibility, etc.)
- after three days: first fast damage estimation
- after 14 days: detailed damage estimation

PROCESS CHAIN

PROCESS CHAIN



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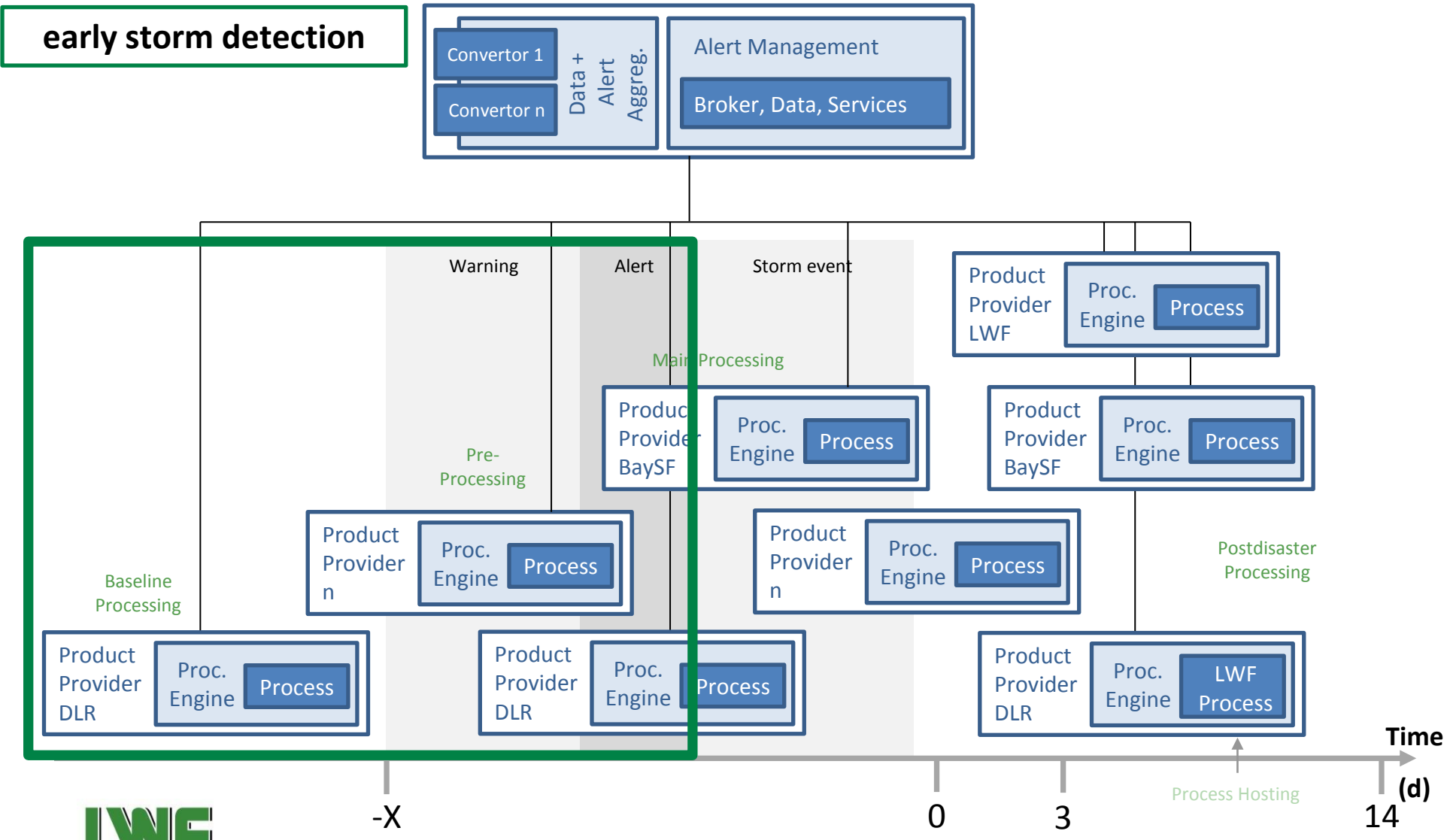

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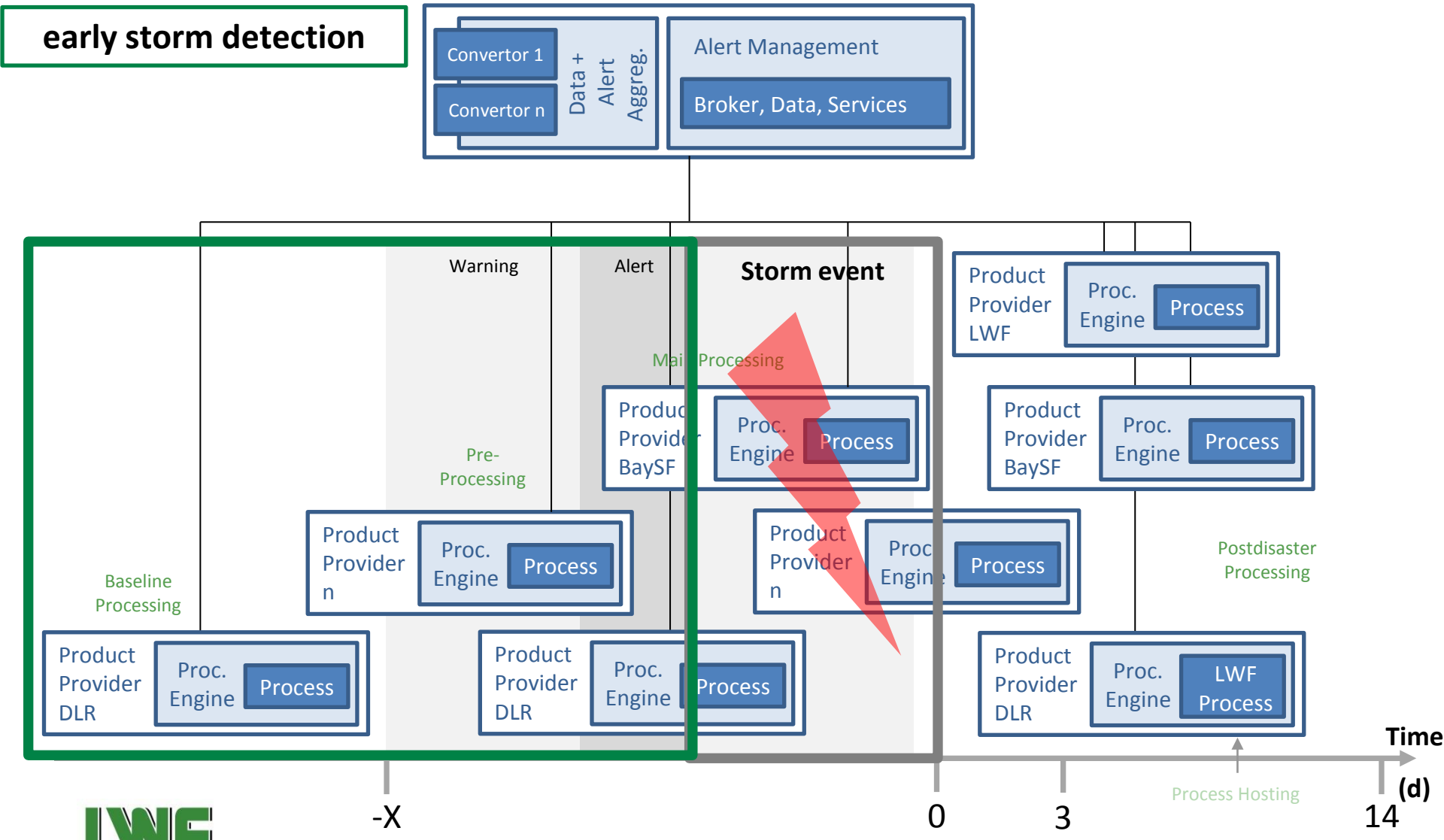
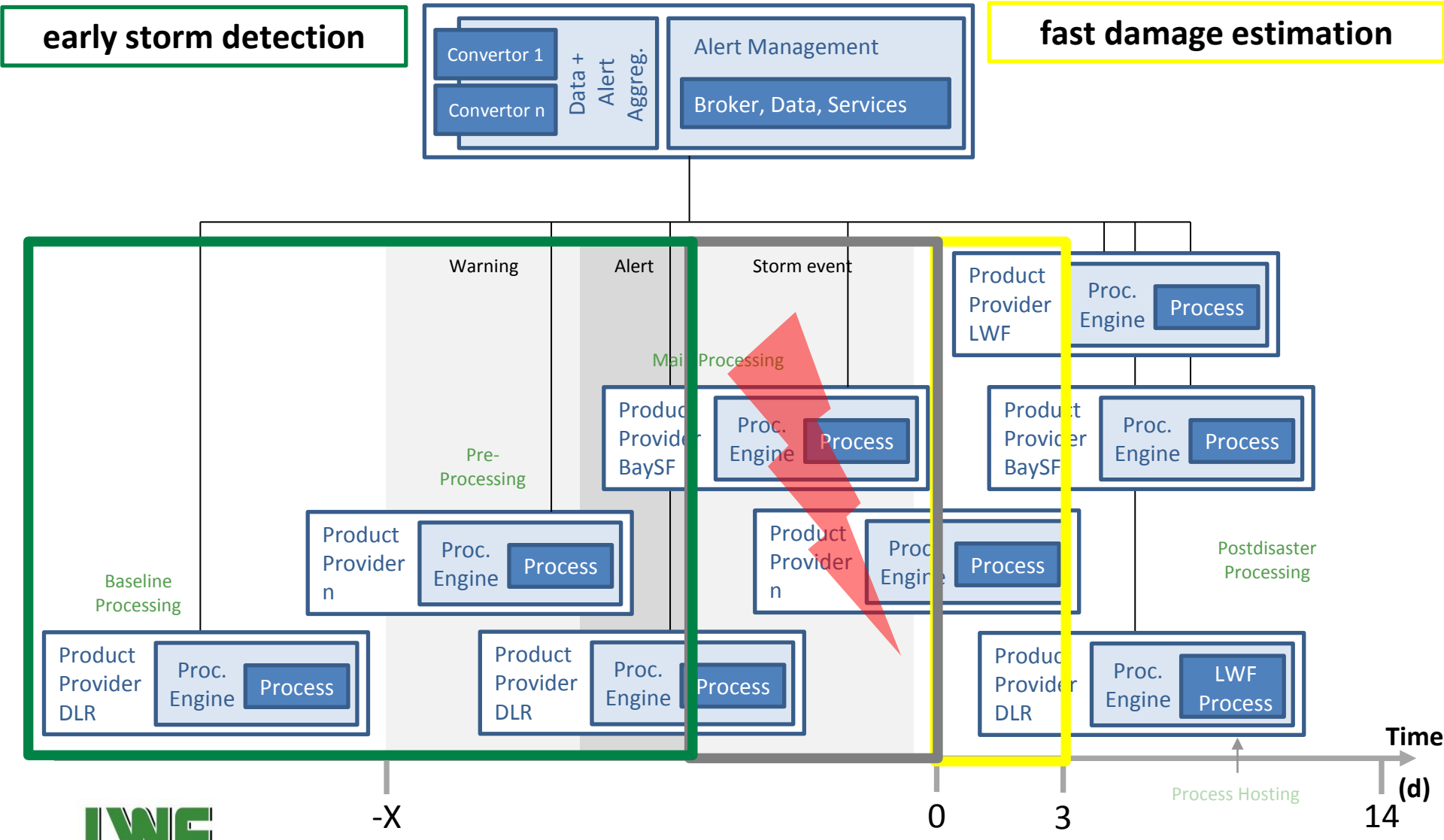
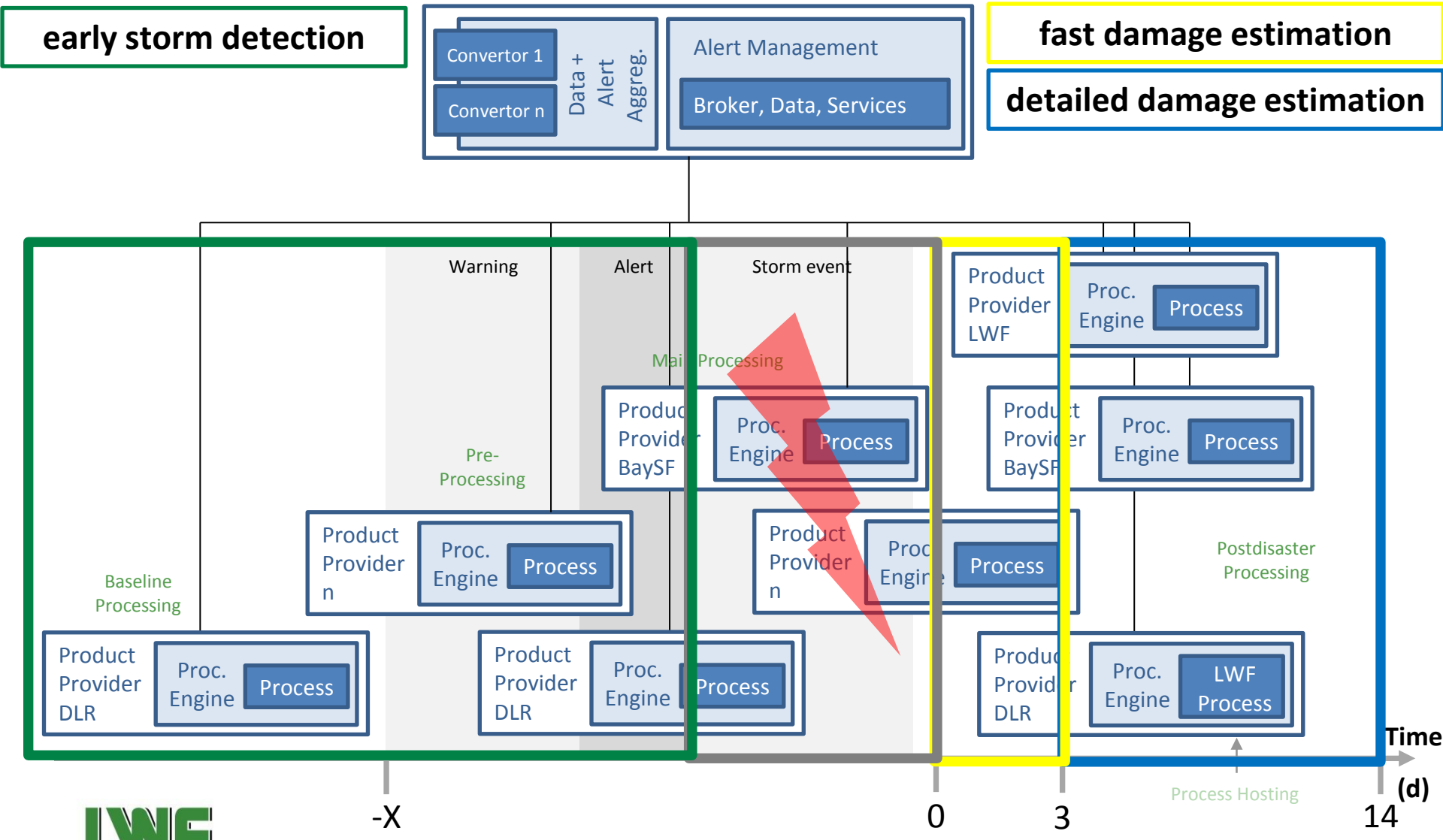



early storm detection
fast damage estimation
Convertor 1
Convertor n
Data + Alert Aggreg.
Alert Management
Broker, Data, Services
Warning
Alert
Storm event
Pre-Processing
Main Processing
Postdisaster Processing
Baseline Processing
Product Provider DLR
Proc. Engine
Process
Product Provider n
Product Provider BaySF
Product Provider LWF
LWF Process
Process Hosting
Time
(d)
-X
0
3
14

PROCESS CHAIN



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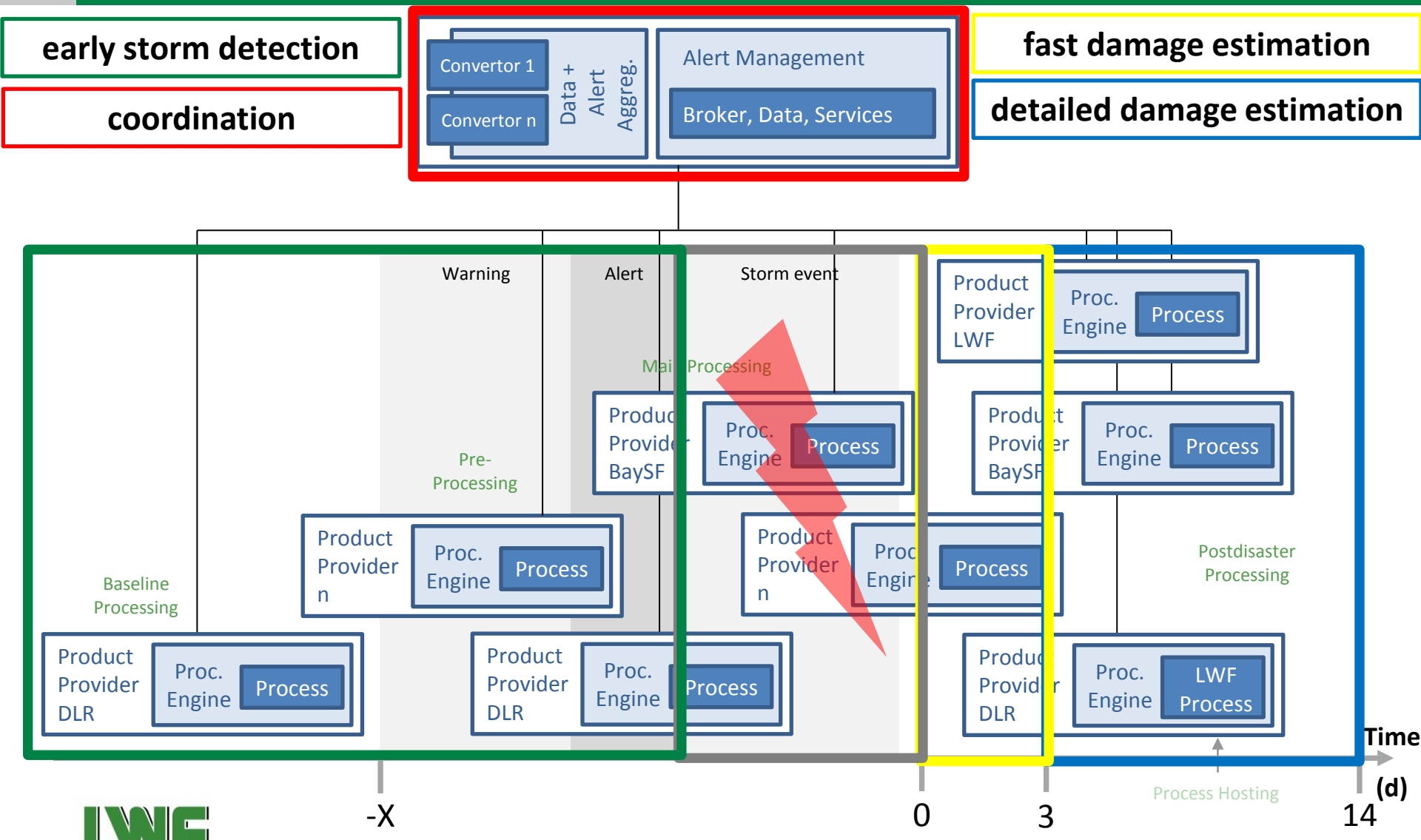
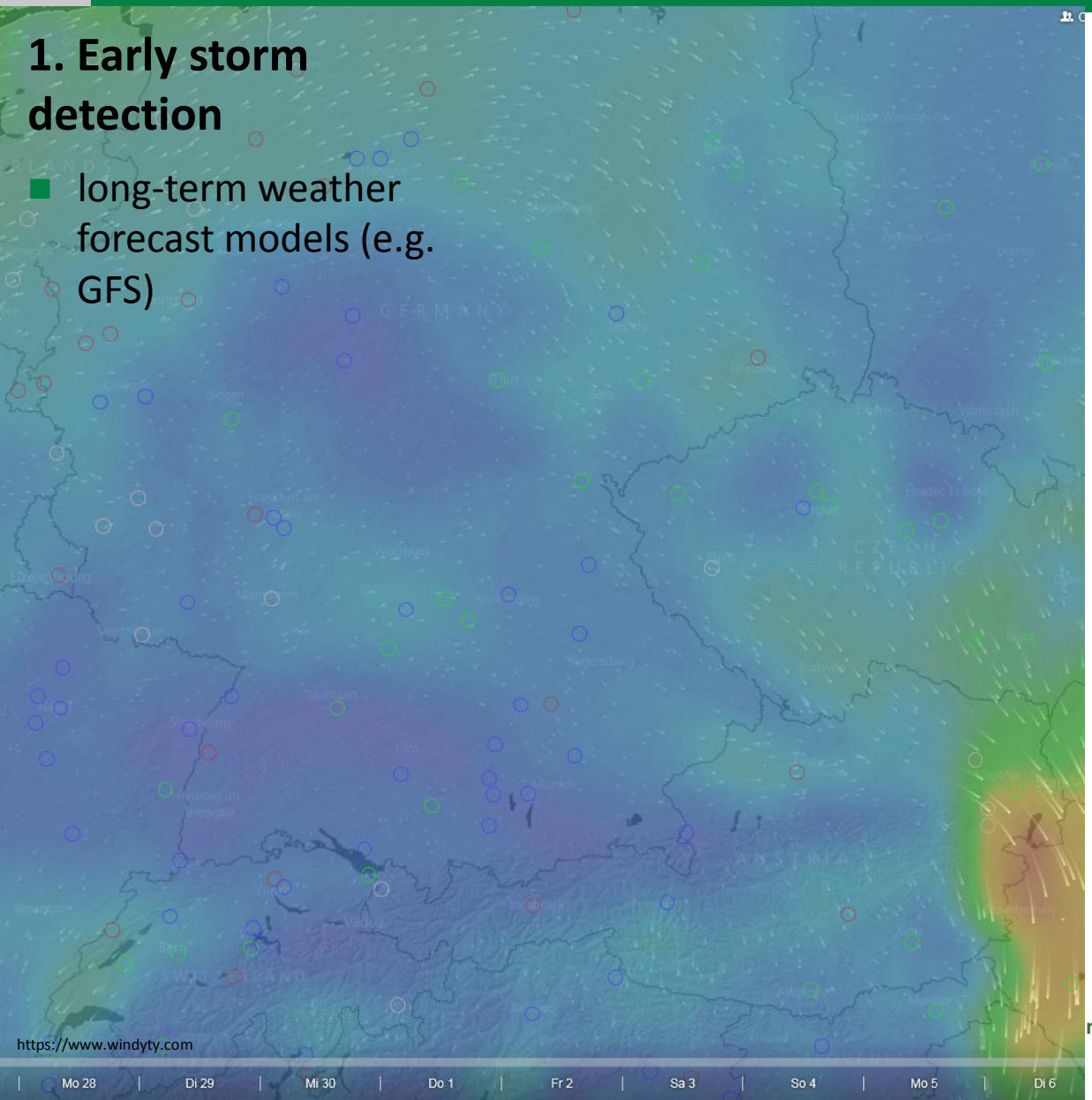


DATA

DATA

1. Early storm detection

- long-term weather forecast models (e.g. GFS)



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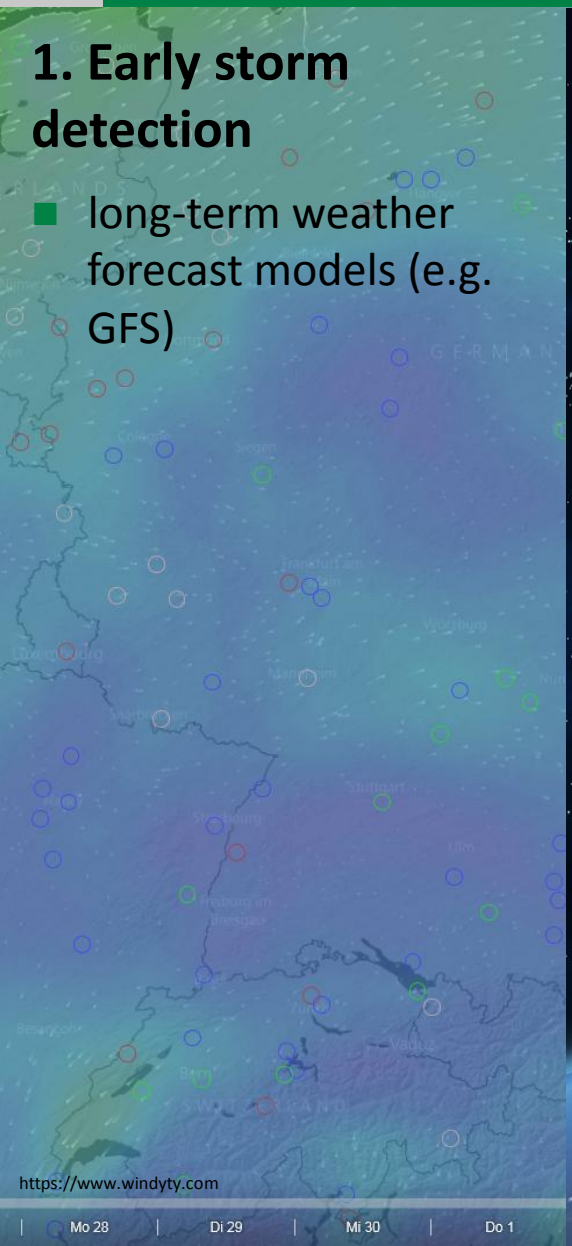
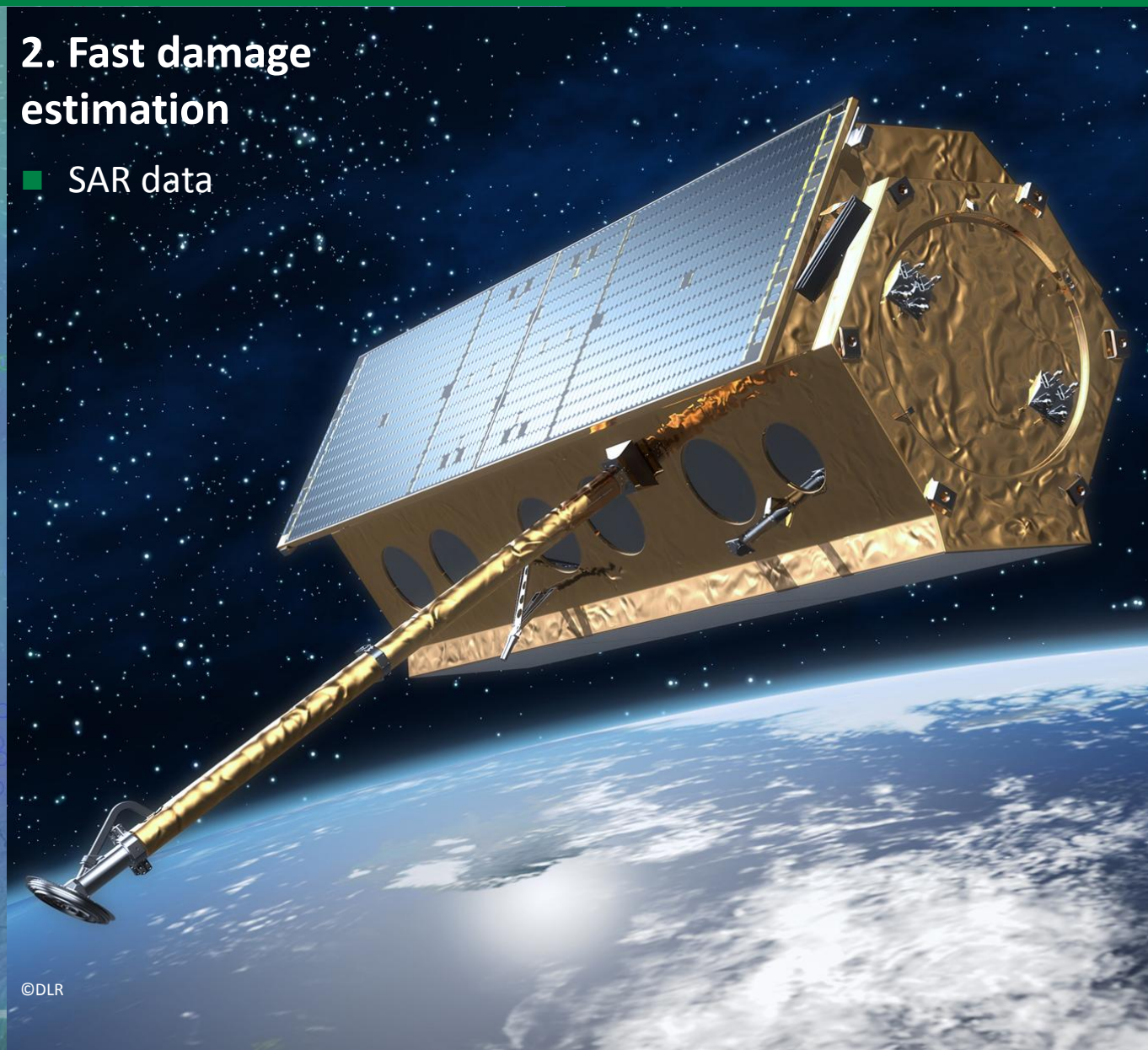


2. Fast damage estimation

- SAR data



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https://www.windyty.com

Mo 28 | Di 29 | Mi 30 | Do 1

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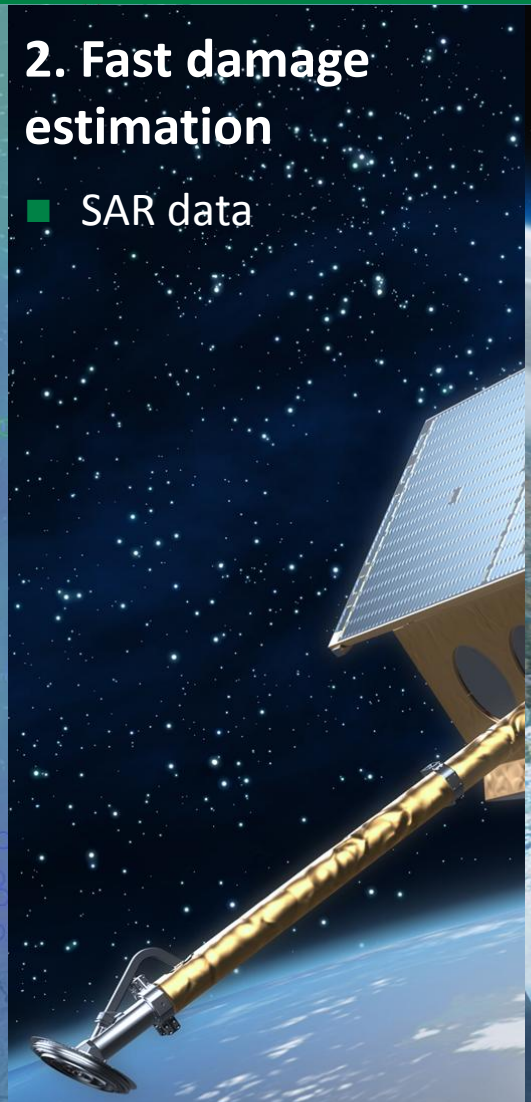
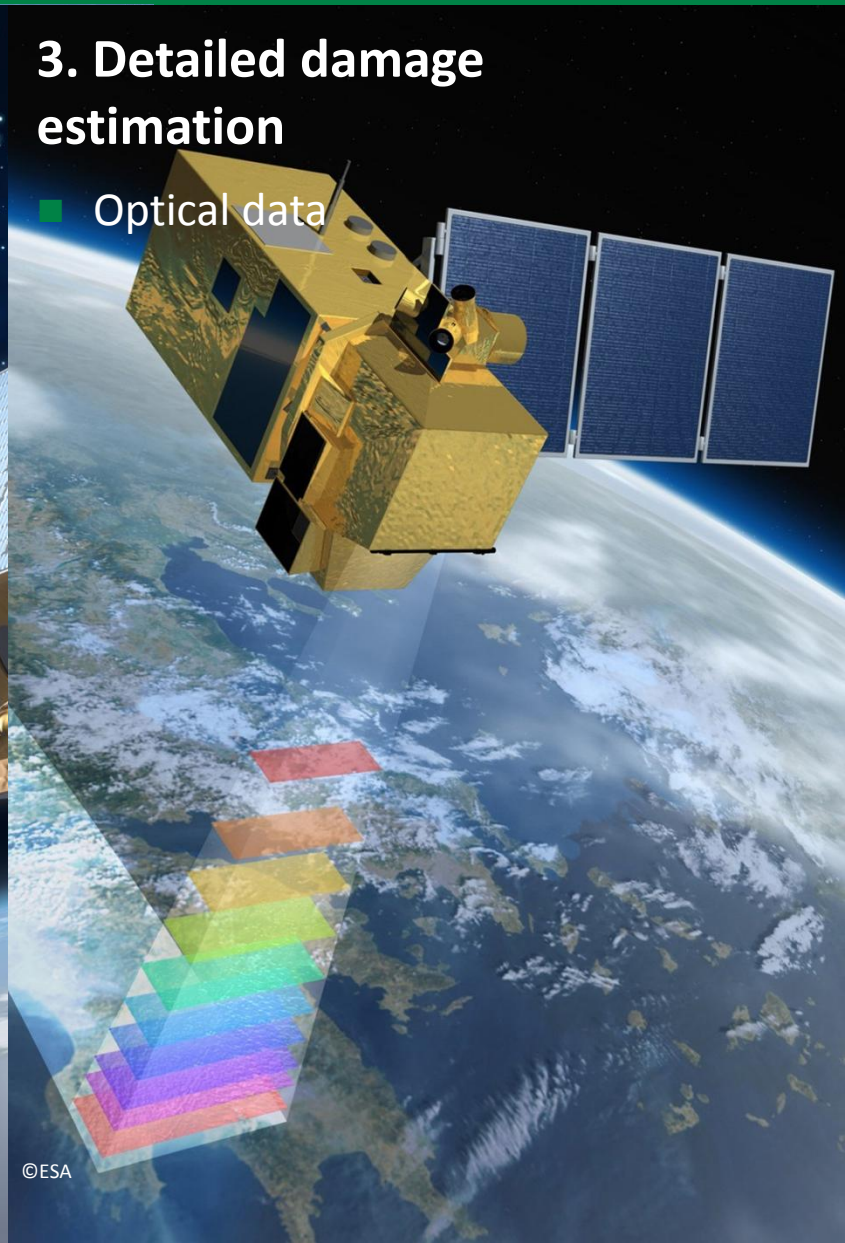


©DLR

3. Detailed damage estimation

- Optical data



©ESA

DATA

additional information (GIS-analysis”) are based on…

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- forestal information

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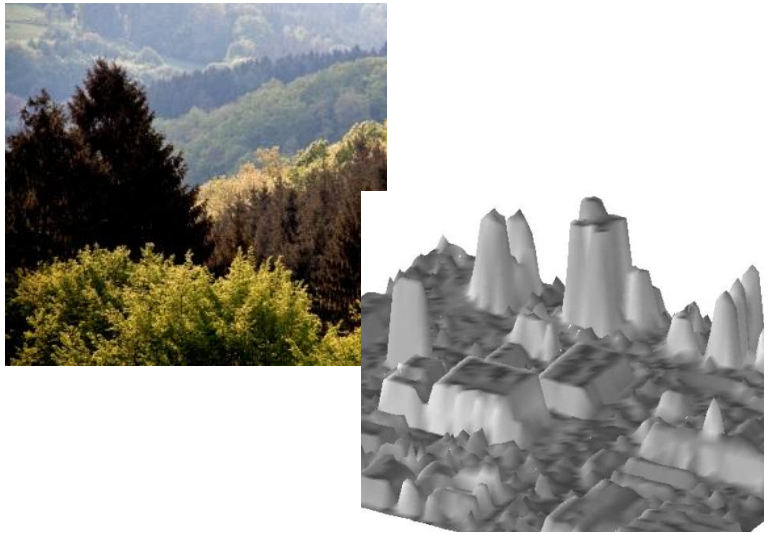
- topography



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additional information (GIS-analysis”) are based on…

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- thematic maps

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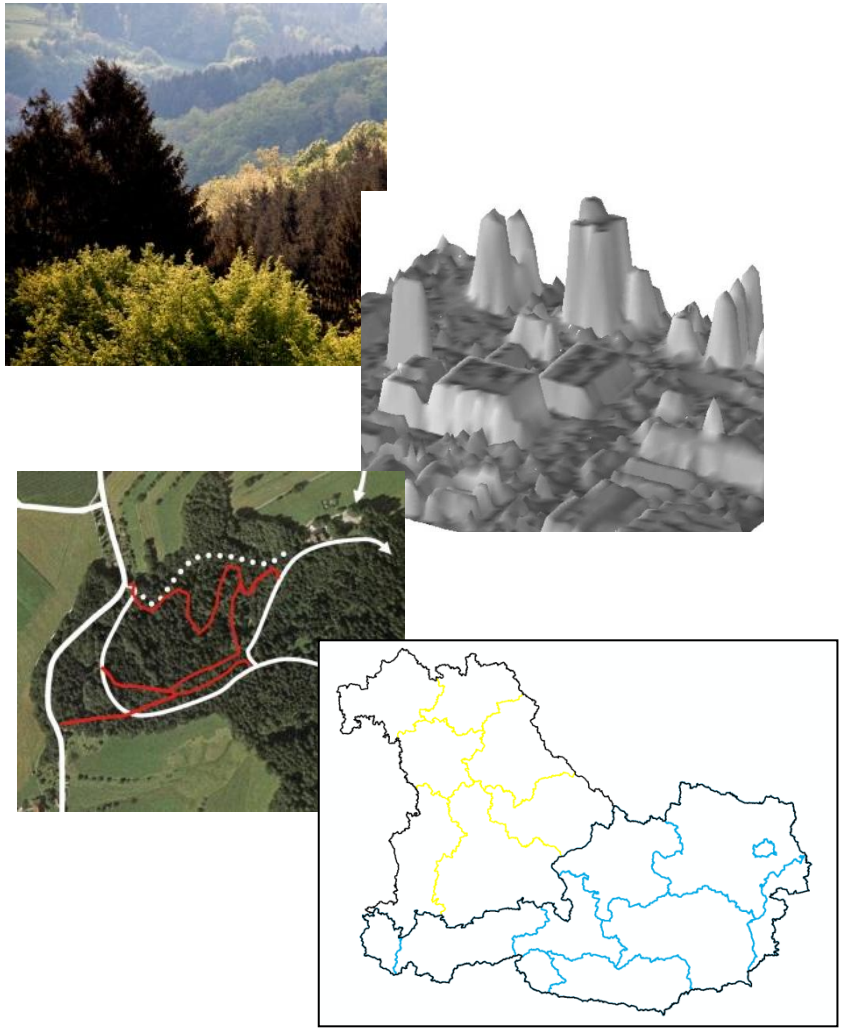
- forestal information
- topographic data
- thematic data
- administrative data

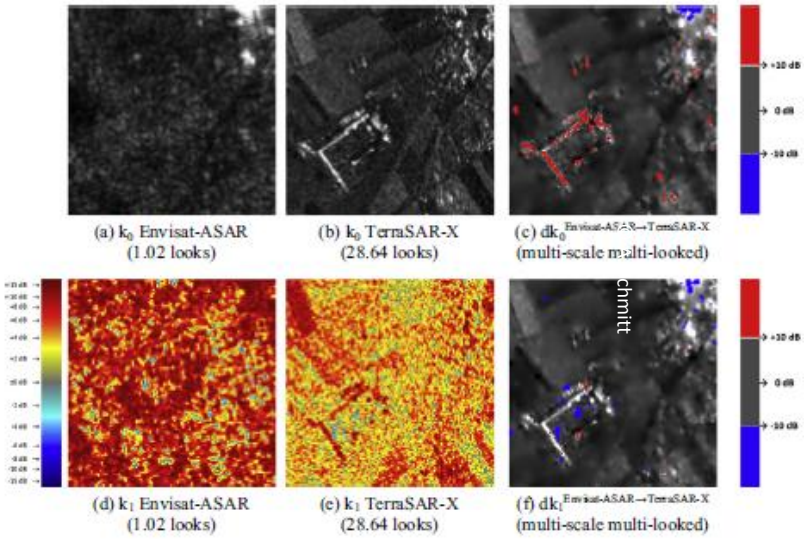


METHODS

Change detection

SAR data

- differential Kennaugh elements[1]
- **joint image enhancement**



[1] Schmitt, Wendleder, Hinz (2015): The Kennaugh element framework for multi-scale, multi-polarized, multi-temporal and multi-frequency SAR image preparation

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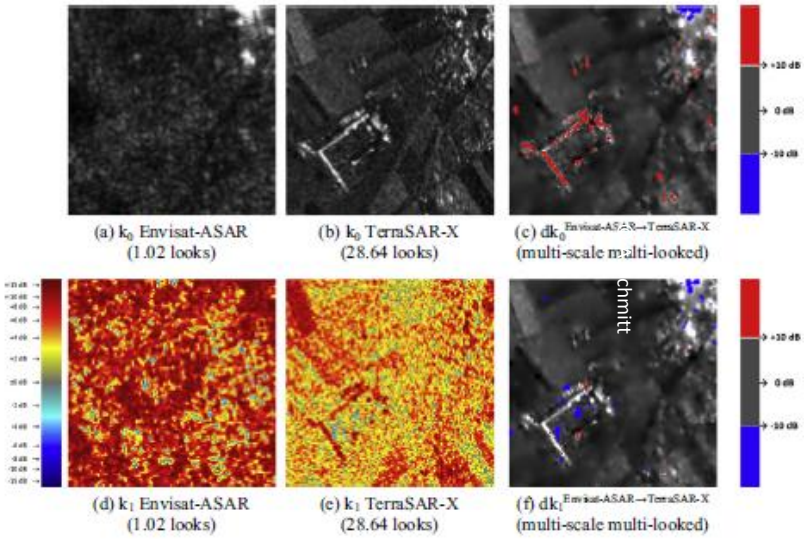
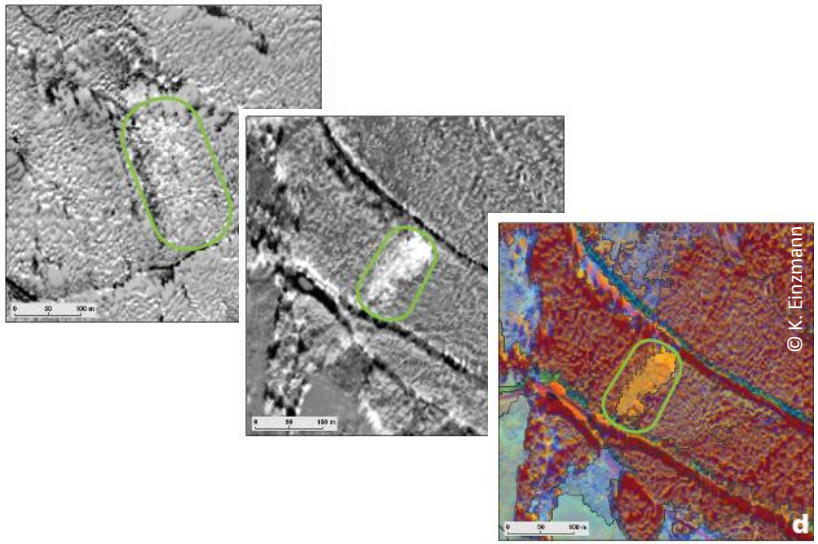


optical data

- pixel-based
- object-based image analysis



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System

System

Information broker („storage“)

System

Information broker („storage“)

Data provider

System

Information broker („storage“)

Data provider

Product provider

System

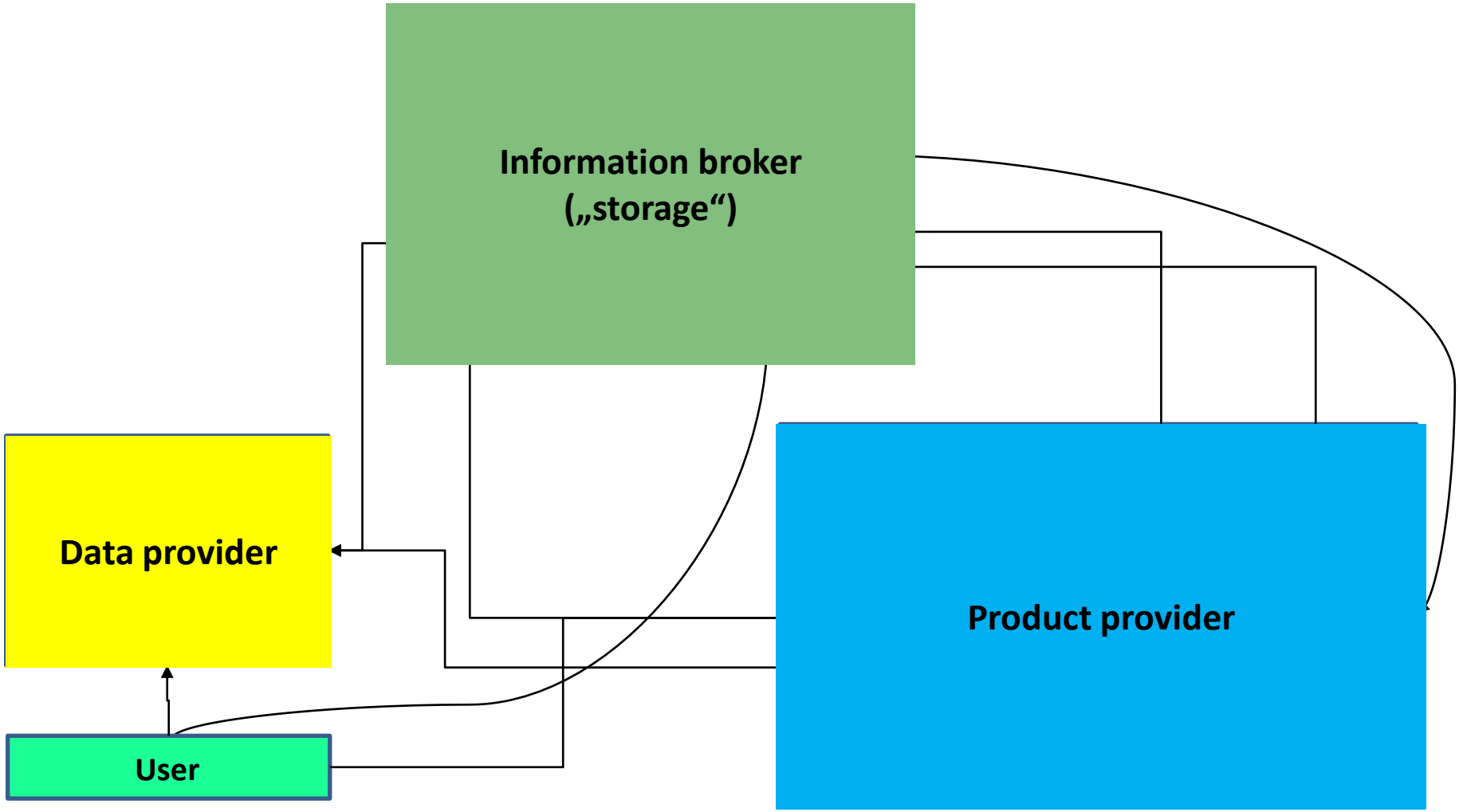
Information broker
(„storage“)

Data provider

Product provider

User

System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EXAMPLE (STORM „NIKLAS“)

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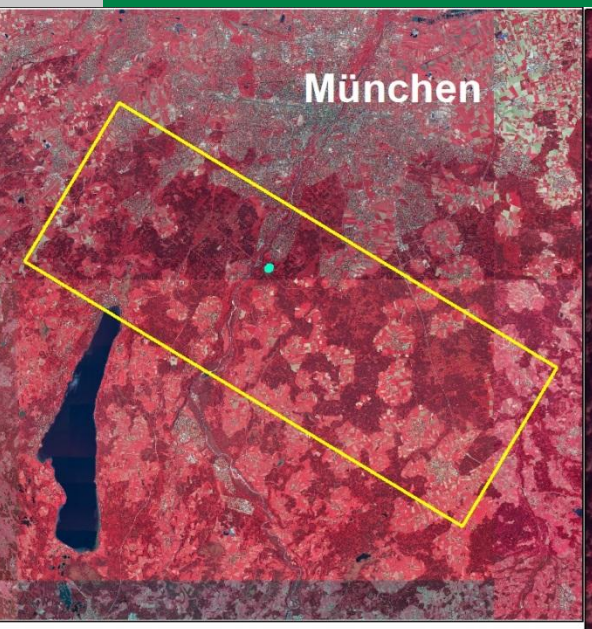
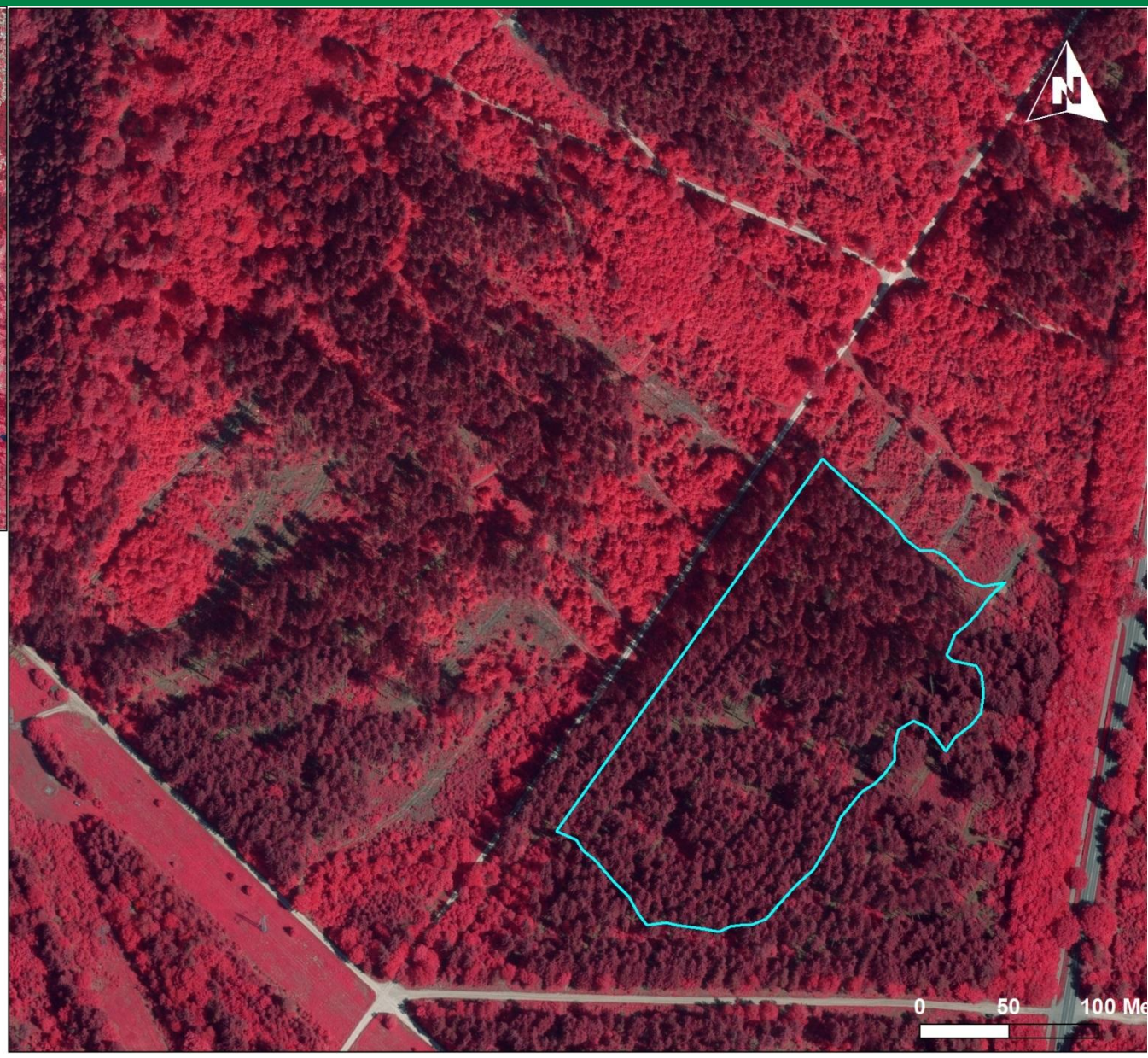


Legende

- Testgebiet München Süd
- Windwurffläche Nr. 24 (GPR eingemessen)
- schwach
- Veränderung aus TSX-Change Detection
- stark
- Veränderungen aus RapidEye-Change Detection
- Veränderungen aus RapidEye-Change Detection >0,5ha



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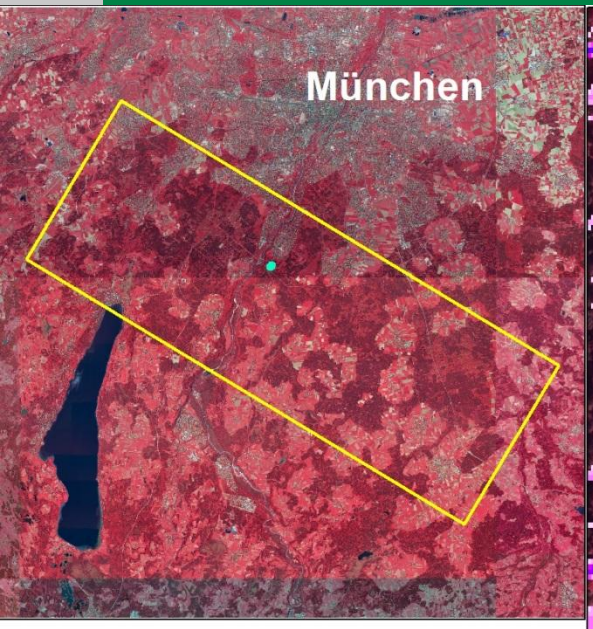

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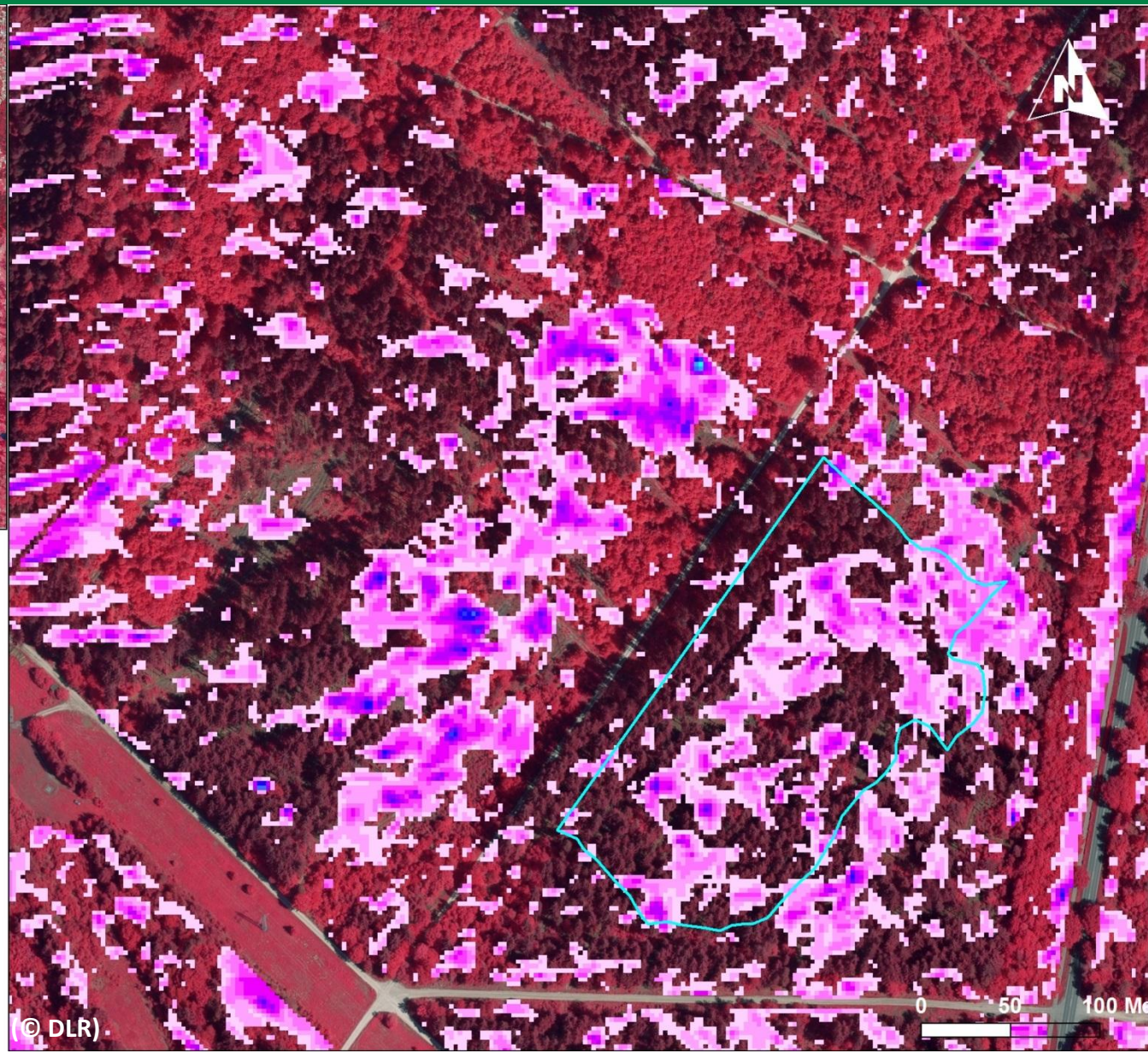

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Thank you for your attention

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on the basis of a decision by the German Bundestag

Questions?

In cooperation with:

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University of Natural Resources and Life Sciences, Vienna

Deutsches Zentrum für Luft- und Raumfahrt
German Aerospace Center

LWF

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