

CAP-ABILITIES OF MODERN WEATHER RADAR NETWORKS

Common Alerting Protocol (Cap) Implementation Workshop

23. – 24. August 2016

André Weipert, Head of MET Information Systems



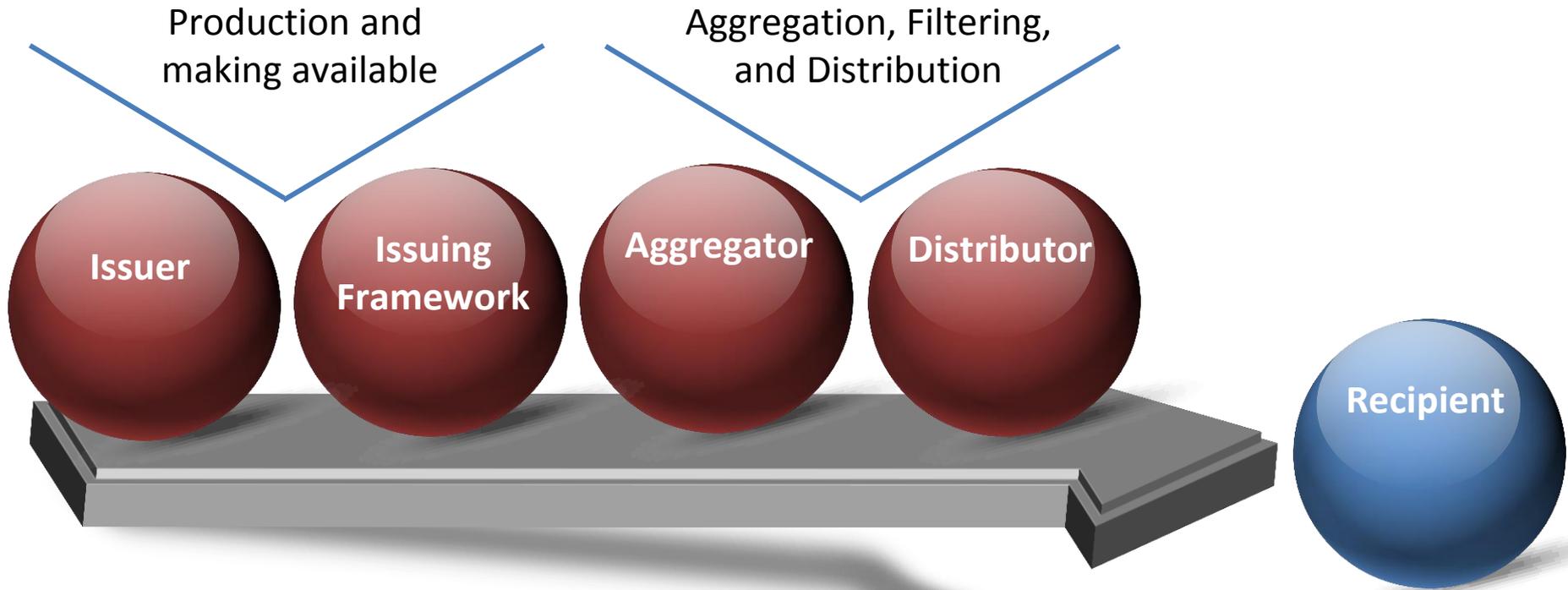


INTRODUCTION

- The presentation will provide an **objective view** on weather radar capabilities.
- The advantage of remote sensing technologies such as radar is inherently given since e.g. for **rapidly growing adverse convection** or conditions, numerical weather prediction fails.
- The **cross-application** usage of modern weather radar systems (single or netted) will be explained.
- The presentation demonstrates that it is **not a big challenge to implement CAP**. The consolidated (=quality controlled), coherent and tailored data input matters.



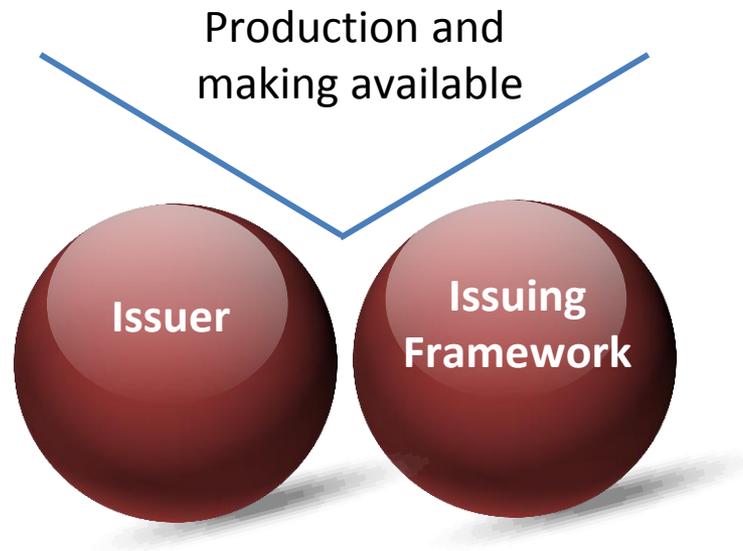
CAP DATA FLOW





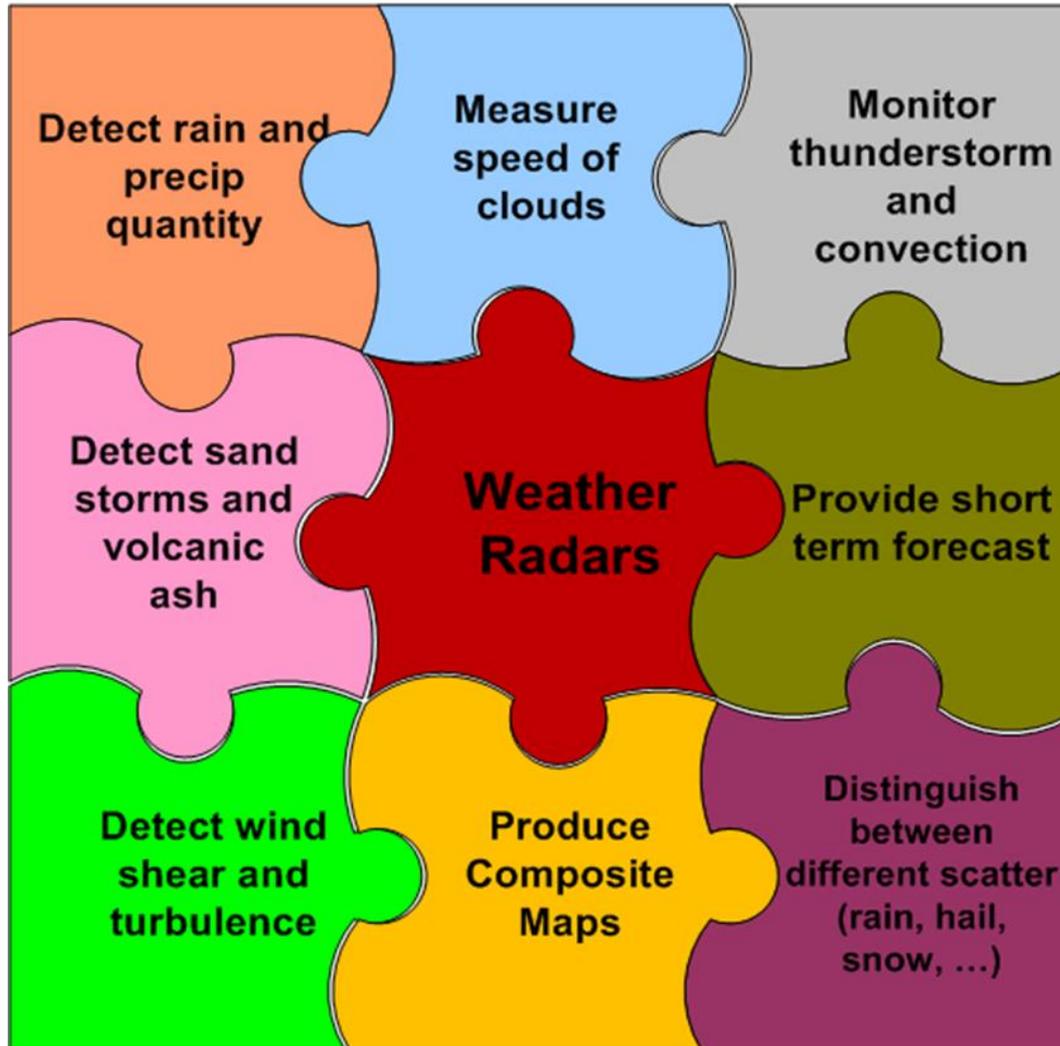
THIS PRESENTATION FOCUSES ON ...

Weather Radar derived MET Services





WHAT DO WE RECEIVE FROM A WEATHER RADAR ?





FOCUS AREAS

Centralized MET Services



Provision of various centralized meso- and large-scale weather information and services for national and international exchange.

Aviation MET Services



Full integration and exchange of MET information and services according to the ICAO GANP and its ASBU methodology as well as WMO CAeM.



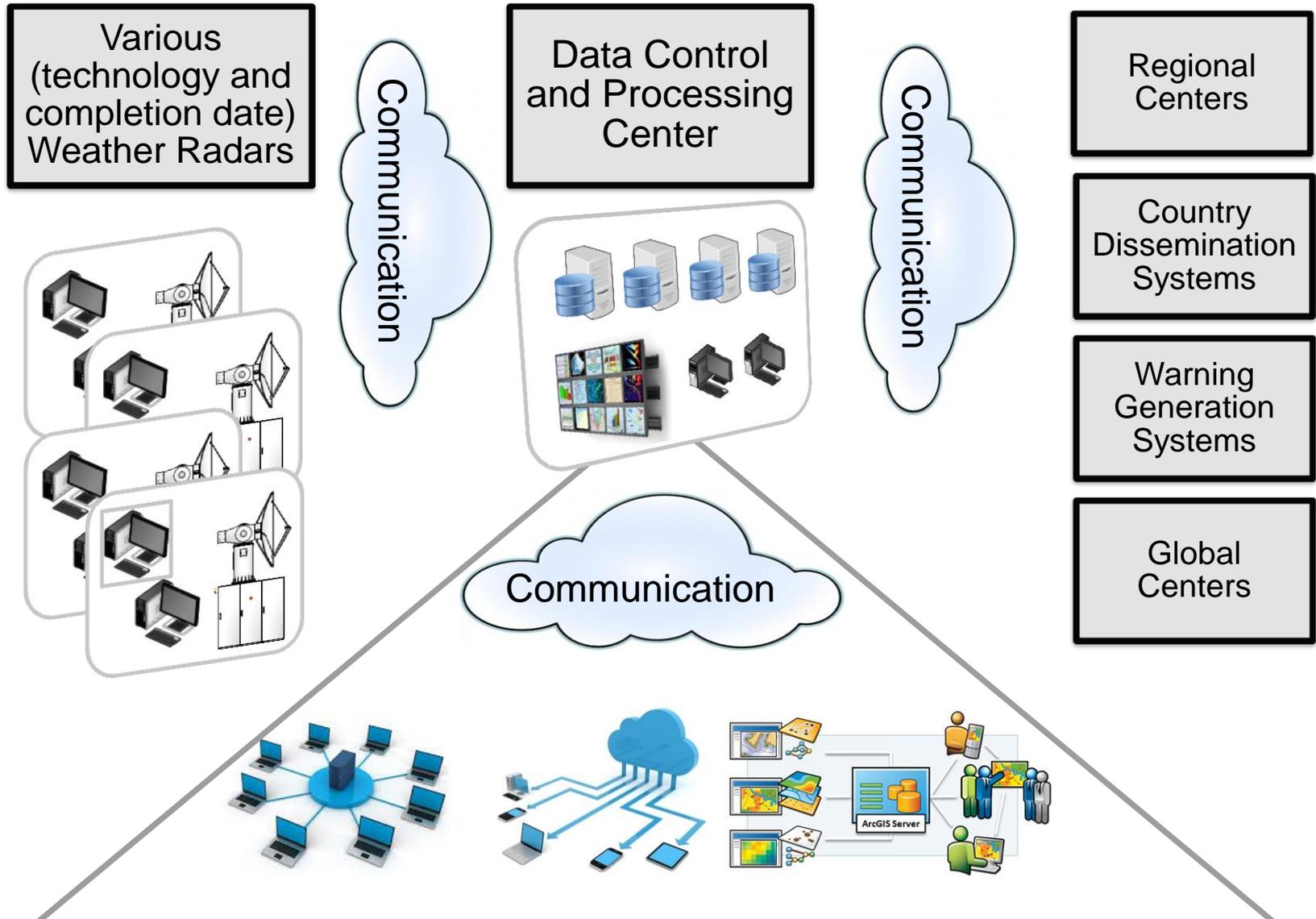
FOCUS AREA

Centralized MET Services





SIMPLIFIED CENTRALIZED SYSTEM LAYOUT





SIMPLIFIED CENTRALIZED SYSTEM LAYOUT

- Continuous and automated acquisition of consolidated (=quality controlled) radar raw data
 - Local MET product generation
 - Production of CAP according to local profile
 - Local network (server and working places)
- Centralized radar monitoring
 - Consolidated MET products
 - Composite management
 - Production of CAP according to local profile
 - Preparation for dissemination (GIS/XML/GML/ODIM/HDF5)
- Sharing of consolidated, consistent and tailored MET products, alerts, geo-tagged information, meta data, gridded data, geo-spatial enabled polygons, CAP (Common Alert Protocol / XML, etc.)

„End User“ data visualization / hybrid systems



LOCAL AND/OR CENTRALIZED MET INFORMATION

Centralized Products

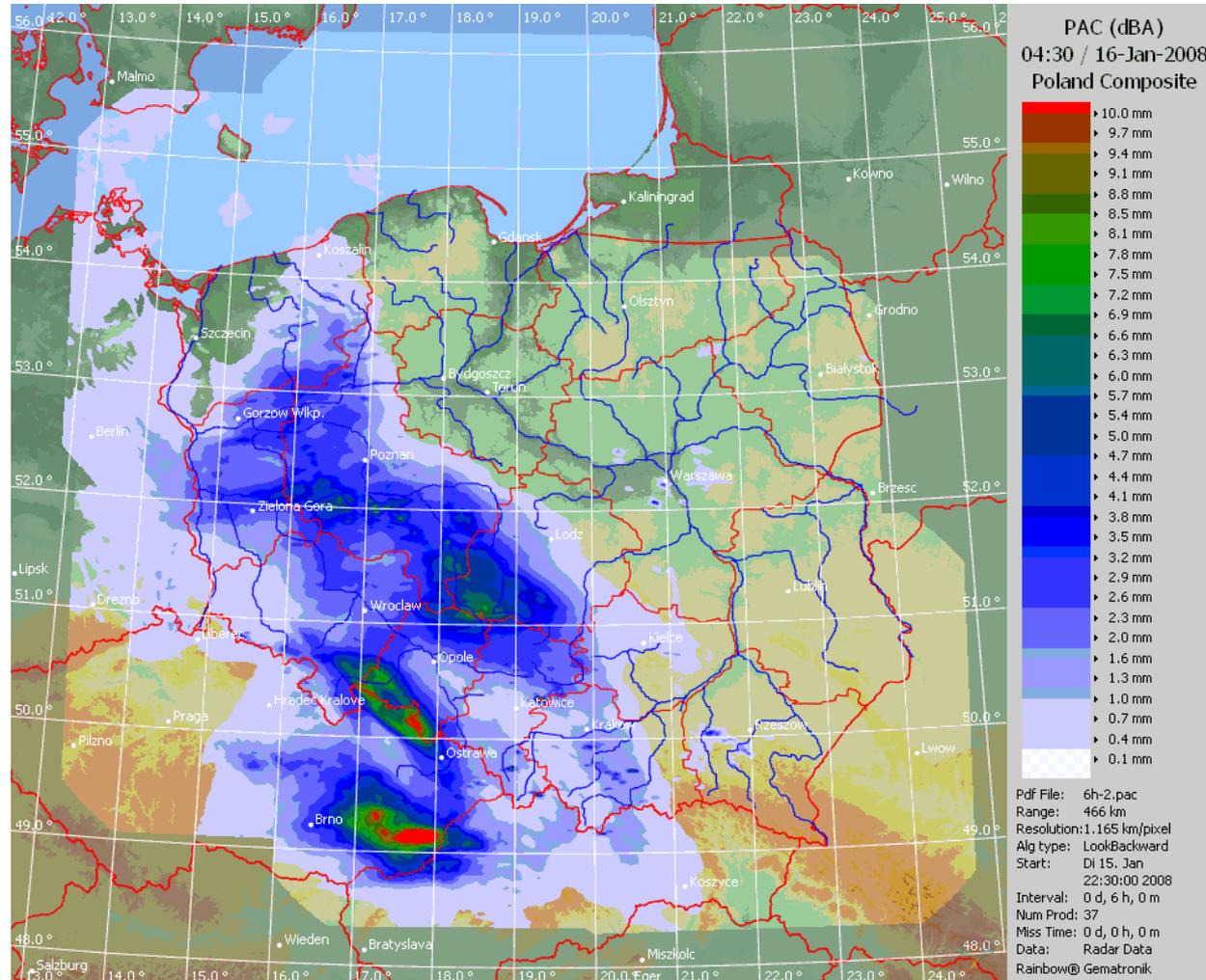
- Surface Rainfall Intensity
- Precipitation Accumulation
- Vertical Integrated Liquid Water Content
- Tracking of Precipitation Fields
- Ensemble based rainfall prediction
- Thunderstorm Tracking
- Multi radar precipitation tracking
- Multi radar rainfall map
- Multi radar thunderstorm tracking

Severe Weather Detection Products

- Severe Weather Indicator (gust front, microburst, thunderstorm, mesocyclone, divergence, convergence)
- Storm Structure Analysis
- Wind Fields
- Echo classification

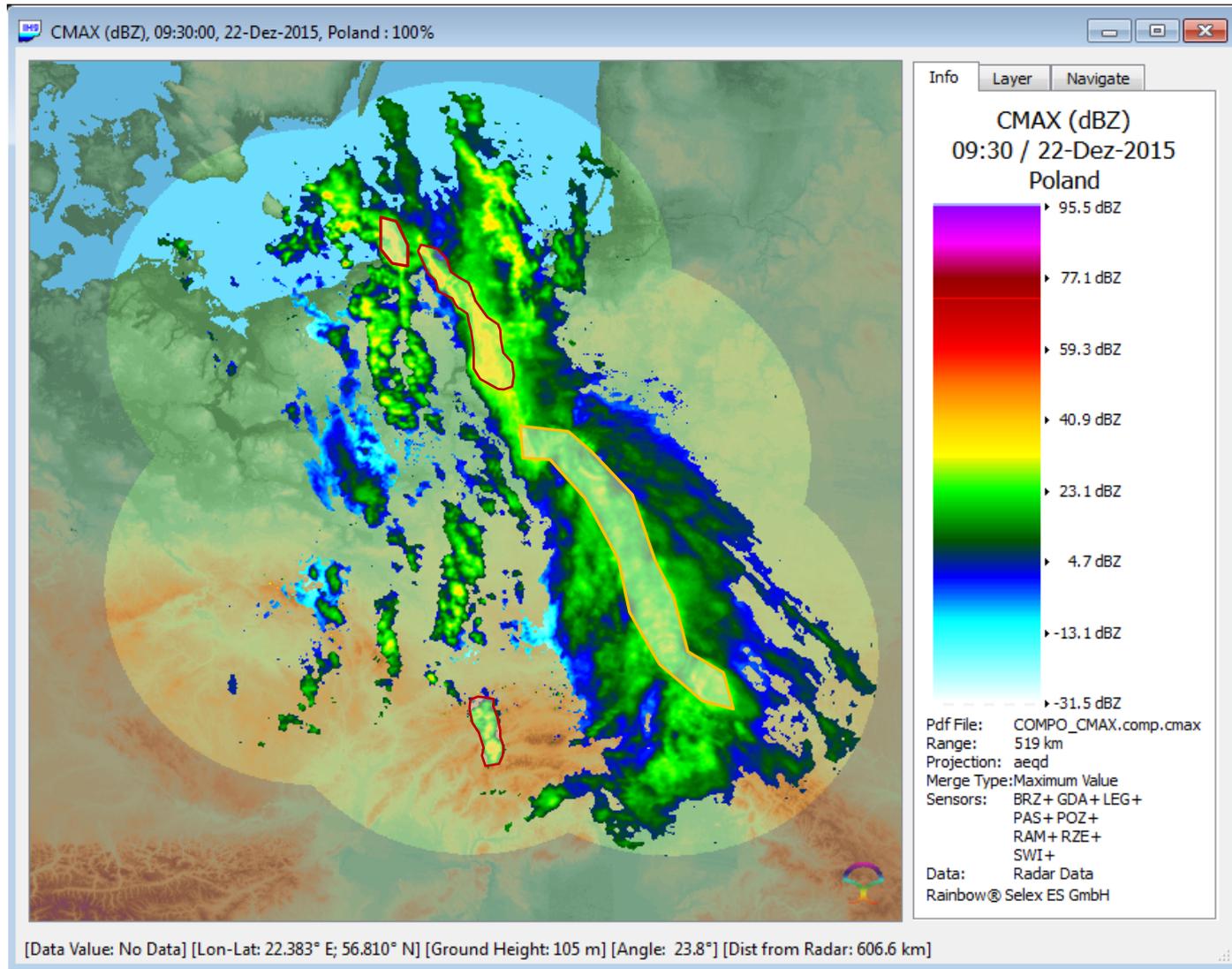


ANIMATION OF PRECIPITATION ACCUMULATION COMPOSITE 8 RADARS, APPR. 450.000 KM²



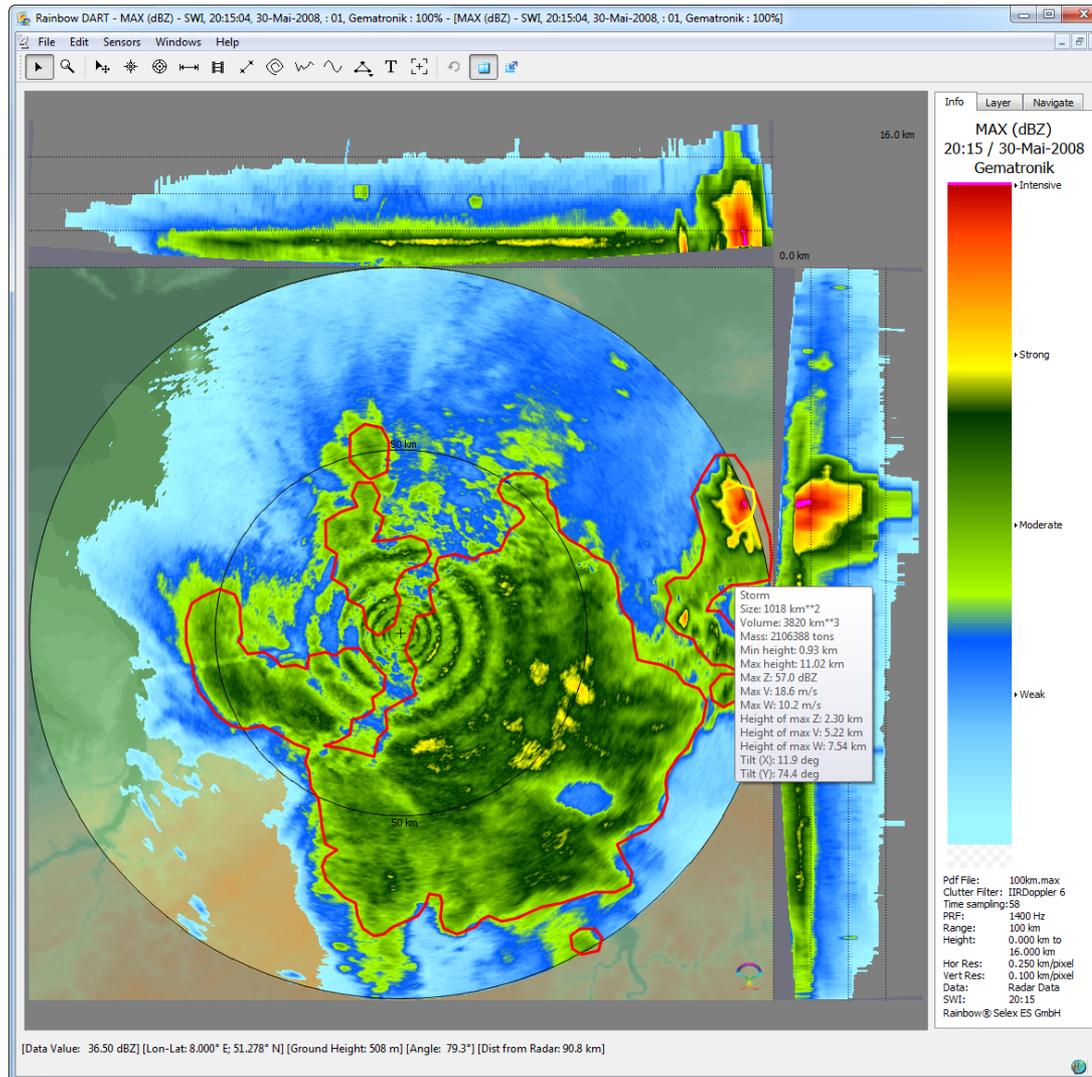


RADAR COMPOSITE MAXIMUM



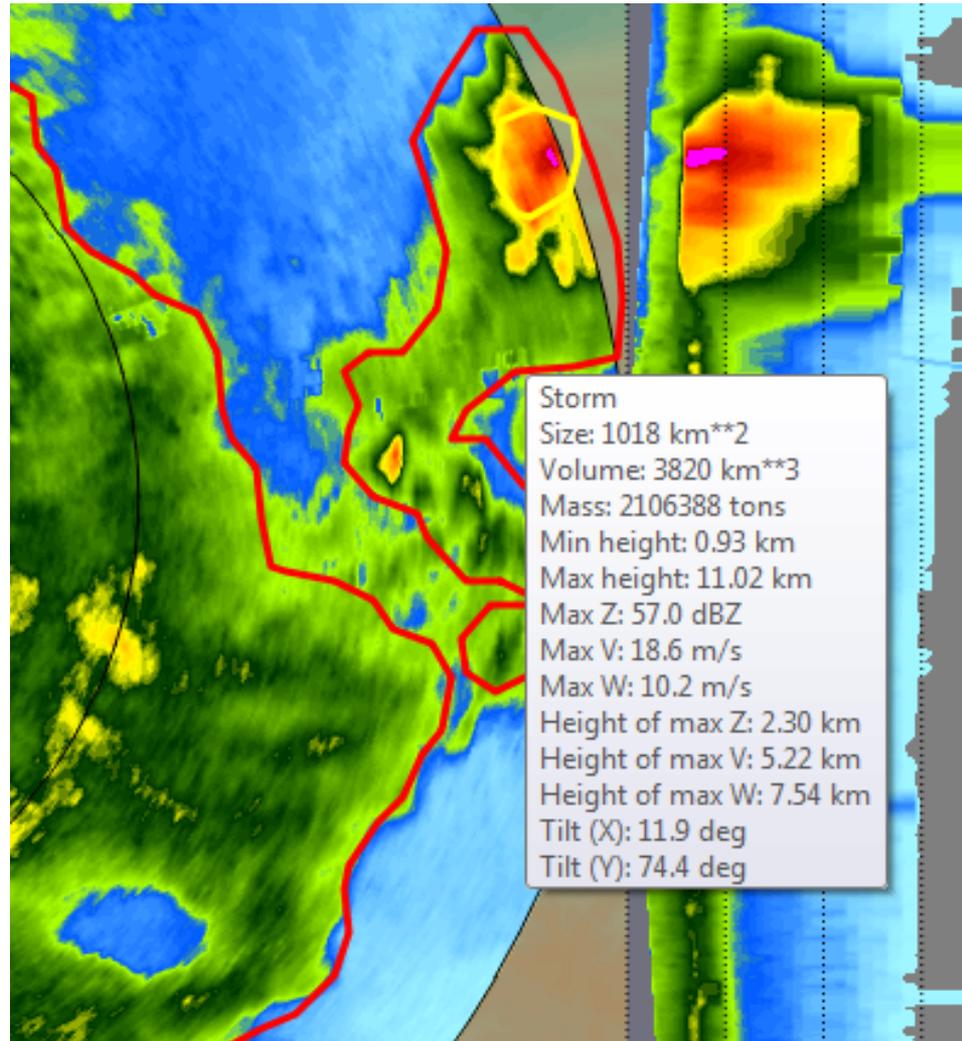


STORM IDENTIFICATION PRODUCT





STORM CHARACTERISTICS





XML CONTENT FOR STORM IDENTIFICATION PRODUCT

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XML CONTENT FOR STORM CORE IDENTIFICATION

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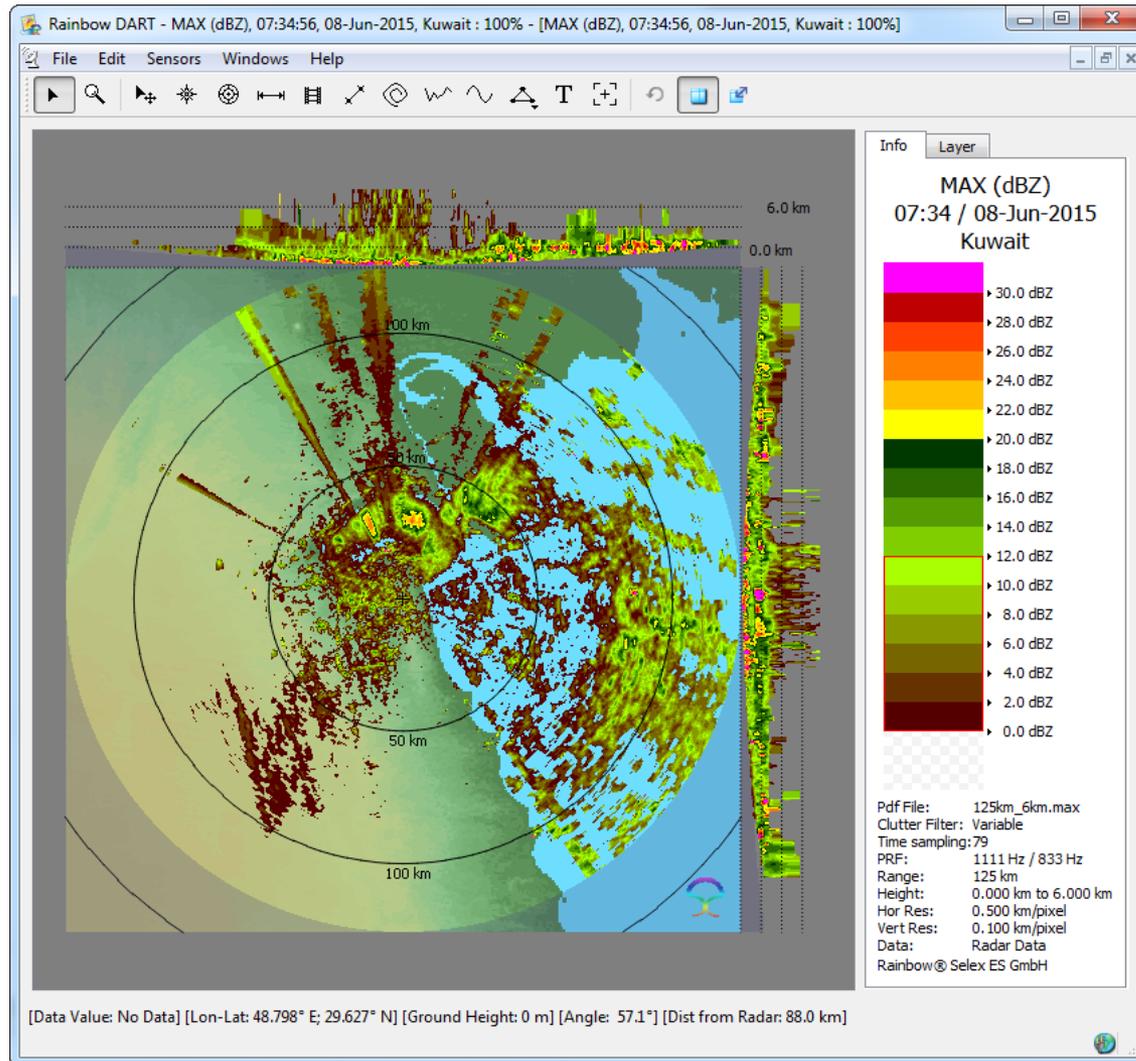


THUNDERSTORM DETECTION CAP OUTPUT

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<cap:severity>Severe</cap:severity>  
<cap:certainty>Observed</cap:certainty><cap:senderName>SmartWxHub</cap:senderName>  
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<cap:description>Radar indicated severe thunderstorm warning, distance 92 km, moving north  
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51.3283,6.4687 51.3462,6.4254 51.4092,6.4250 51.4318,6.4826 51.4454,6.5475 51.4723,6.5257  
51.5038,6.5472 51.5039,6.6050 51.4725,6.6340 51.4365,6.6124 51.4185,6.6485 51.3870,6.6341  
51.3600,6.6054 51.3646,6.6918 51.3736,6.7566 51.3600,6.8142 51.3285,6.8357 51.3061,6.8141  
51.2881,6.7350 51.2746,6.7134 51.2432,6.6919 51.2162,6.7134 51.1577,6.6919 51.1262,6.6274  
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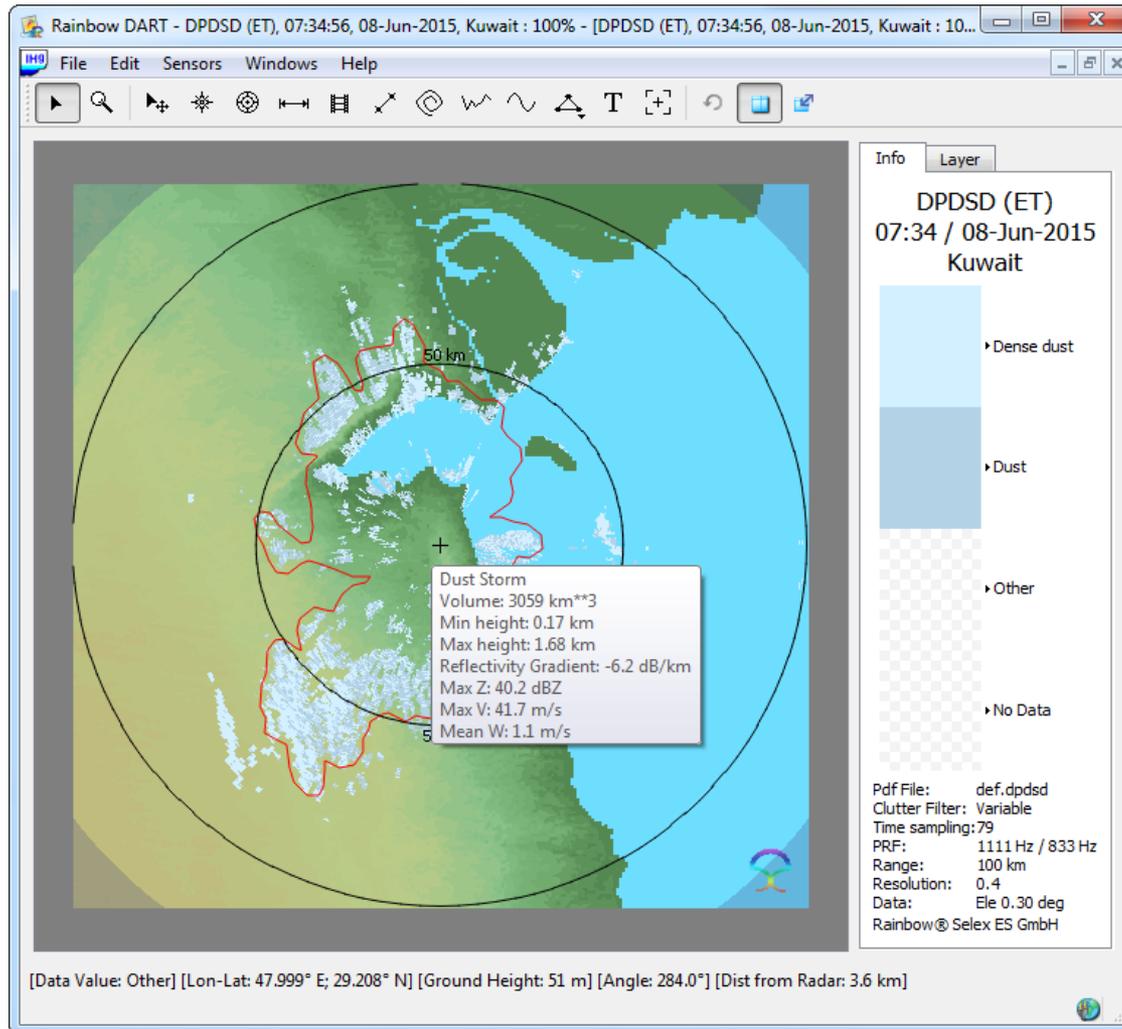


KUWAIT: RADAR DERIVED ALERTS ON SAND STORMS





KUWAIT: EXTRACTED SAND STORM POLYGON





XML CONTENT OF SAND STORM DETECTION

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47.643892 47.648127 47.660636 47.664917 47.673276 47.681581 47.689894 47.685896 47.710652 47.751830 47.797142 47.813612
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29.103218 29.095946 29.067111 29.052702 29.045422 29.016563 28.987773 28.966237 28.944606 28.973283 28.983952 28.983864
28.962220 28.911843 28.883034 28.850643 28.832689 28.818315 28.778730 28.775003 28.760547 28.785675 28.814417 28.828678
28.821349 28.799727 28.774566 28.760197 28.720648 28.695525 28.674054 28.666878 28.652434 28.612884 28.598621 28.605935 </cell>
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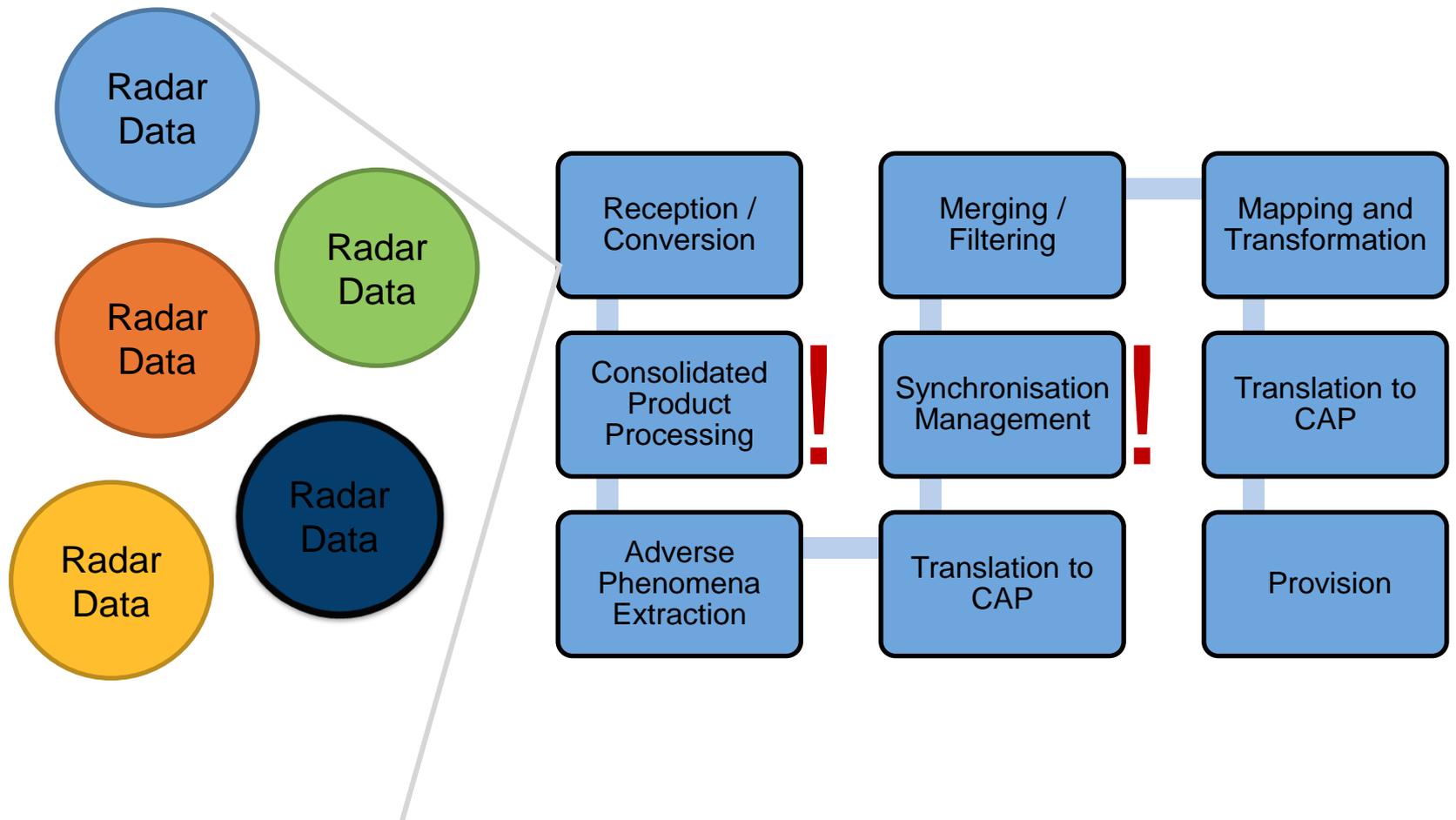


SAND STORM CAP OUTPUT

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SANDSTORM</cap:event> <cap:responseType>Prepare</cap:responseType>
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29.1280,47.6077 29.1533,47.6446 29.1605,47.6652 29.1534,47.6941 29.1391,47.7394 29.1212,47.7889 29.1213,47.8383 29.1069,47.8260 29.0997,47.7889 29.0780,47.7602
29.0528,47.7438 29.0348,47.7356 29.0383,47.7109 29.0455,47.6821 29.0166,47.6410 28.9878,47.6329 28.9374,47.6455 28.9446,47.6290 28.9661,47.5960 28.9624,47.5714
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SUMMARY: CENTRALIZED SERVICES





FOCUS AREA

Aviation MET Services





WEATHER INFORMATION MATTERS



ASBU: Aviation System Block Upgrade
GANP: Global Air Navigation Plan (DOC 9750)
ICAO: International Civil Aviation Organisation
ICAO Annex 3: Meteorological Service for International Air Navigation
ICAO DOC9817: Manual on Low Level Wind Shear
GASP: Global Aviation Safety Plan

RASG: Regional Aviation Safety Group
CAeM: Commission for Aeronautical Meteorology
SWIM: System Wide Information Management

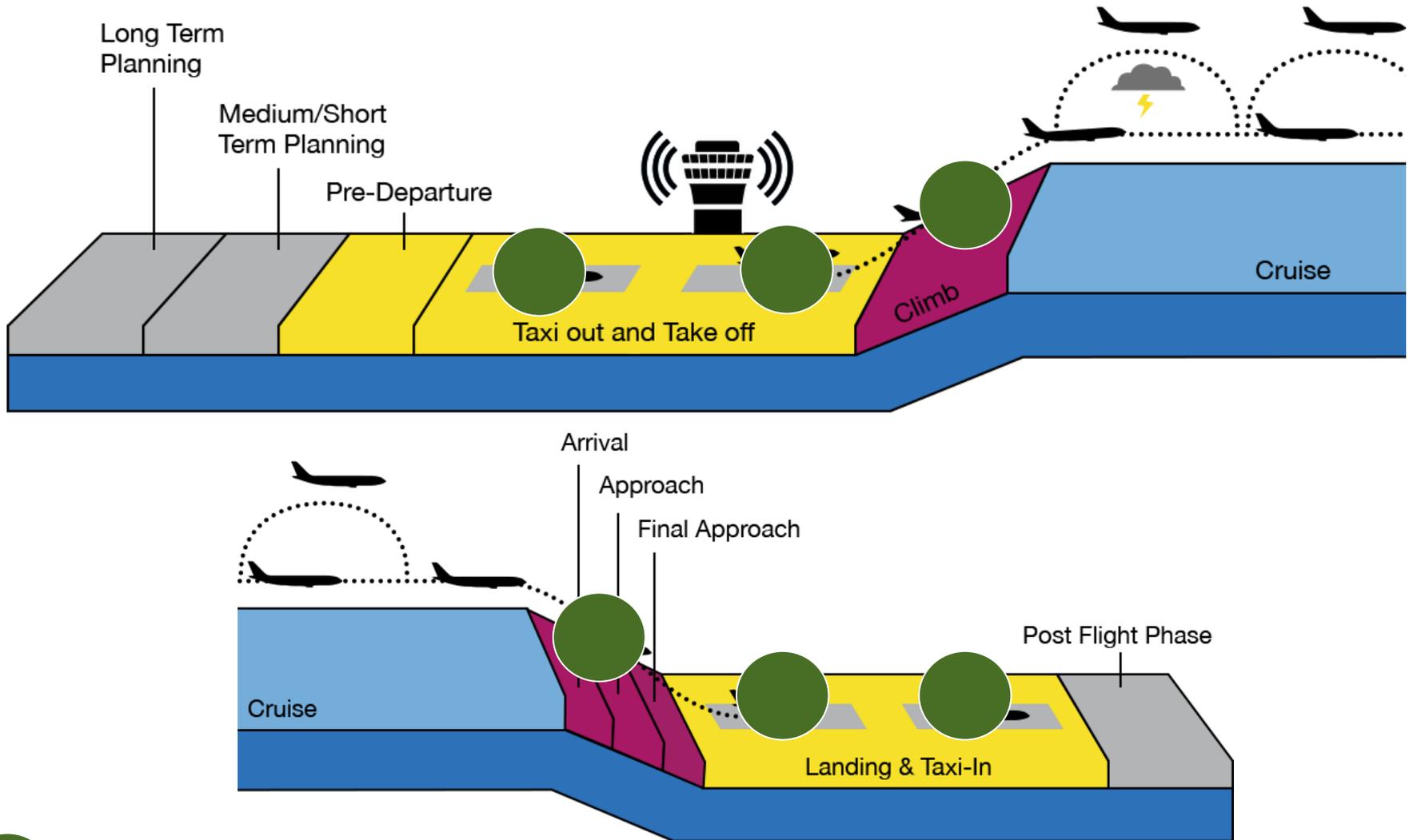


MET SERVICES FOR AIR TRAFFIC MANAGEMENT

- Meteorological Service Provision (MSP) is needed for strategic, pre-tactical and tactical **situational awareness** and **decision making**.
- MSP is an essential ingredient of the **Global Air Navigation Plan** (GANP) and its implementation methodology **Aviation System Block Upgrade** (ASBU).
- MSP is part of **regulatory documents** such as ICAO DOC 9817 (Manual on Windshear) and ICAO Annex 3.
- MSP will be enhanced on **sustainable level** worldwide (refer to ICAO ASBU Block 0 and 1).
- **Sharing and provision** of meteorological services is needed to improve the ATM safety, efficiency and service quality. Please refer also to WMO CAeM and associated working groups.



THE DIFFERENT FLIGHT PHASES

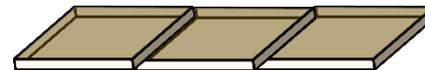


 Radar is Key



WIND SHEAR DETECTION ON GLIDE PATH

Runway Extensions
3 NM

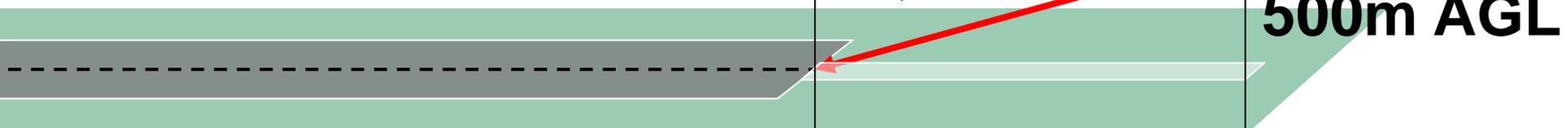


ILS: 3 deg



500m AGL

Distance to runway heads:
7000 - 9500m



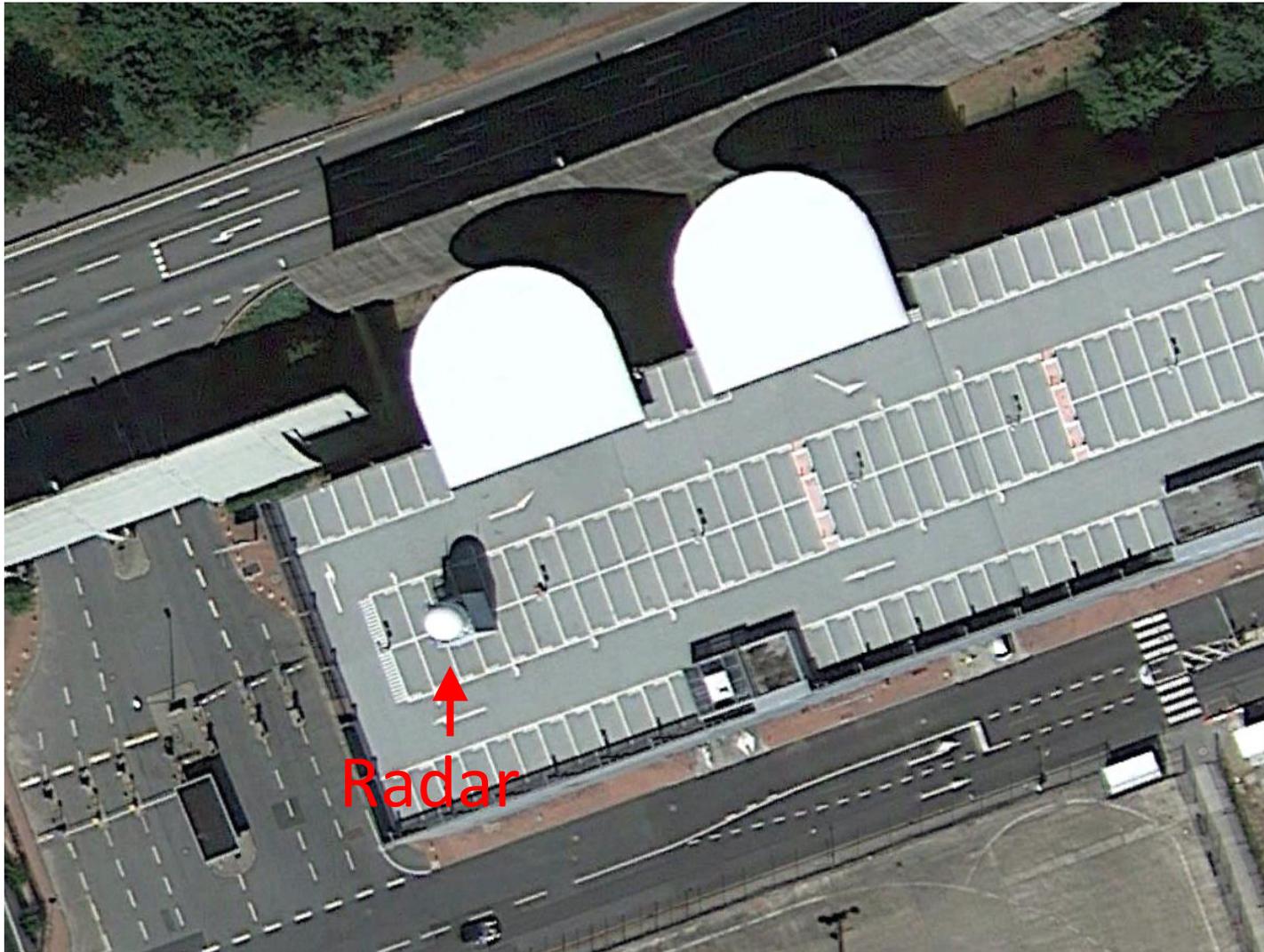


WEATHER RADAR PROVIDES ...

- Wind shear detection
- Turbulence detection
- Microburst detection
- Gust front detection
- Thunderstorm identification
- Base wind profiling
- Runway oriented wind speed loss / gain
- Runway oriented wind profiles
- Glide slope monitoring
- Flight level related information
- Echo classification (rain, hail, ...)



INSTALLATION AT FRANKFURT AIRPORT



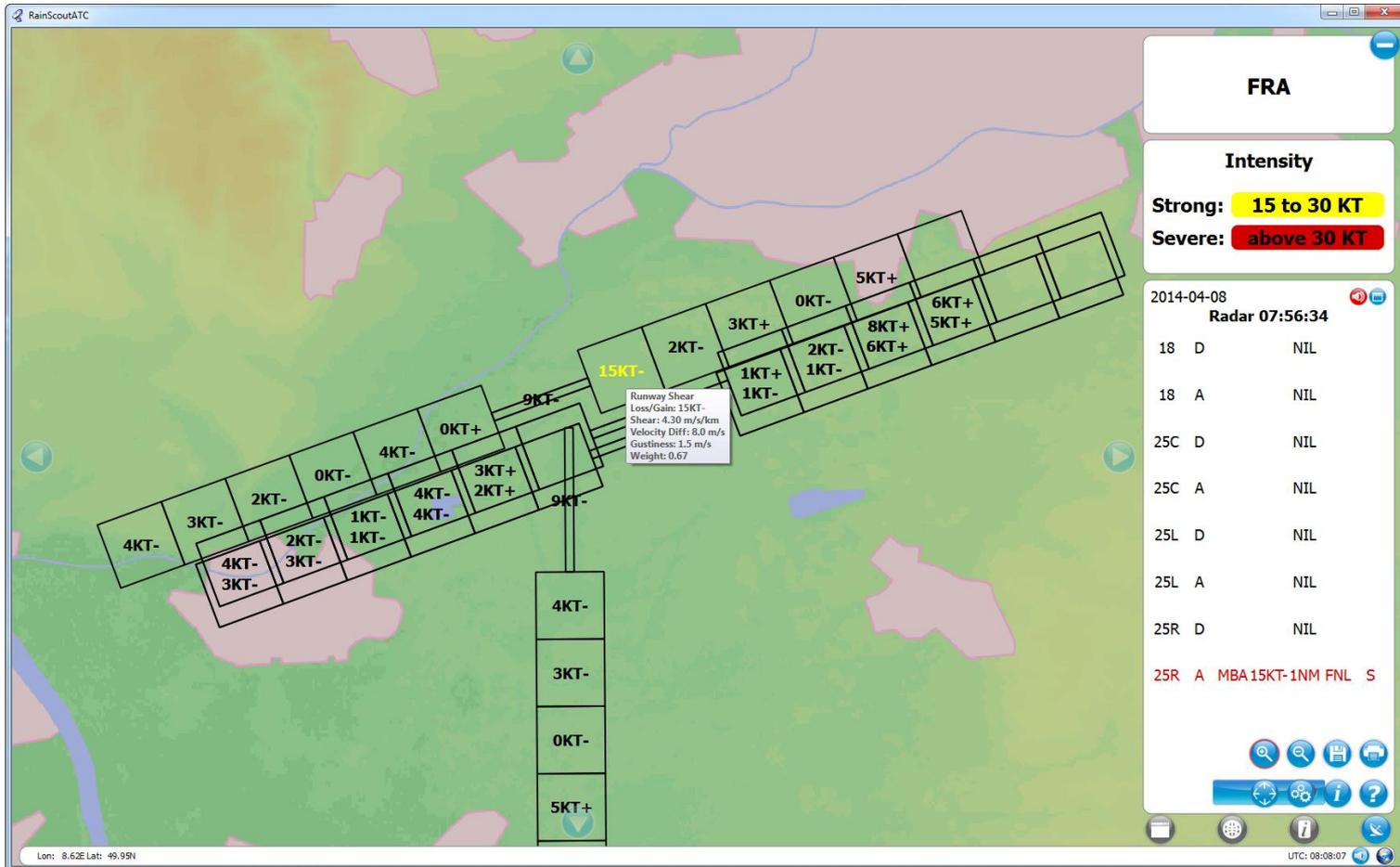


WIND SHEAR RADAR FRANKFURT AIRPORT





FRANKFURT: TOUCHSCREEN SITUATION DISPLAY GRAPHICAL MODE





CAP EXAMPLE FOR WIND SHEAR ALERT AT FRANKFURT AIRPORT

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<contact>lbz.mitte@dwd.de</contact>
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SUMMARY





SUMMARY

Elevate situational awareness.

- Weather radar information (single and netted) is an essential ingredient for the generation of public alerts on severe weather conditions.

Assess.

- There is still strong potential (and necessity) to improve the coherent provision of weather services using or extending the existing infrastructure in a sustainable manner.

Think lateral.

- State-of-the-art weather radar information can be used for different applications.

Share.

- MET services shall be fully aligned with the interoperability framework and international standards of other disciplines including but not limited to aeronautical, meteorological and geospatial standards. CAP performs.



Thank you for your attention

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