FRINGE 2015 – SORTED RECOMMENDATIONS

This document contains the collected recommendations of the Fringe 2015 Workshop, "*Advances in the Science and Applications of SAR Interferometry and Sentinel-1 InSAR Workshop*" that was organised on 23-27.3.2015 in ESA-ESRIN, Frascati, Italy. The recommendations have been sorted in to five categories listed below and the session/sessions where the recommendation was given is indicated.

1 LIST OF ACRONYMS

CoM	Centre of Mass
DInSAR	Differential InSAR
EC	European Commission
EW	Extended Wideswath
ITRF	International Terrestrial Reference Frame
IW	Interferometric Wideswath
PDGS	Payload Data Ground Segment
PS	Persistent Scatterer
PSI	Persistent Scatterer Interferometry
PSIC4	Persistent Scatterer Interferometry Codes Cross-Comparison and Certification
S-1	Sentinel-1
S1A/S1B	Sentinel-1 A/B
TEP	Thematic Exploitation Platform
TBC	To Be Confirmed
TOPS	Terrain Observation by Progressive Scans
WAP	Wide-Area Product

2 CATEGORIES OF RECOMMENDATIONS

The recommendations have been sorted into the following five categories:

- Sentinel-1 Operations
- Sentinel-1 Data Processing and Dissemination
- Sentinel-1 Observation Scenario
- The ESA Historical SAR Archive
- Future Studies and R&D

3 RECOMMENDATIONS RELATED TO: S-1 OPERATIONS

No	Recommendation	From Session
1	When S1B is available ESA should perform a limited duration (6 months?) "science-phase" experimenting with special acquisition geometries. The actual impact of these experiments on the operational requirements of the Copernicus services should be assessed. ESA should evaluate the proposed options for the experiments , which at this stage include: • Azimuth shift sensitivity improvement using double-TOPS or staggered TOPS. • Height-sensitivity increase by positioning S1B with a say 300m (TBC) baseline with respect to S1A for TBC cycles.	InSAR with S-1, InSAR Theory
2	ESA should improve the accuracy of the S-1 precise orbit products to 1cm level to allow high-precision positioning and to aid phase unwrapping.	InSAR with S-1, InSAR Theory, PSI and DInSAR
3	ESA should provide extra auxiliary data for geodetic applications in a "geodetic support product". These extra data include: • The time-dependent vector from the CoM of the satellite to the antenna phase center. • Meteorological and ionospheric conditions. • Coordinate system info (ITRF, solid Earth tides). The geodetic support product should be defined, demonstrated and validated.	InSAR Theory, PSI and DInSAR
4	ESA should investigate whether it is possible to increase the size of the orbital tube in order to improve 3D PS positioning, without jeopardising the main applications particularly in geophysics.	PSI and DInSAR
5	Keep the orbital tube to 120m or smaller.	Earthquakes and Tectonics
6	Place S1B in the same orbital tube as S1A.	Earthquakes and Tectonics
7	Small orbital tube is required to reduce DEM sensitivity and maintain coherence as best possible.	Volcanoes

4 RECOMMENDATIONS RELATED TO: S-1 DATA PROCESSING AND DISSEMINATION

No	Recommendation	From Session
8	ESA should distribute all acquired images to users also in SLC format.	InSAR with S-1, PSI and DInSAR, Earthquakes and Tectonics
9	ESA should provide access to all historical data (no rolling of the archive).	InSAR with S-1
10	ESA should support S-1 co-registered data products. Two possible approaches have been identified: • PDGS to provide co-registered stacks. • PDGS to add auxiliary co-registration information (accurate azimuth shifts) with respect to a reference orbit.	InSAR with S-1, Earthquakes and Tectonics
11	ESA should ensure PDGS SAR processor geometric accuracy (e.g. no assumptions like the start-stop-approximation should be used in the focusing algorithm.	InSAR Theory
12	ESA should investigate ways that lead to an acceleration of the turn-around time from data reception, via focusing to delivering SLC products and metadata	PSI and DInSAR
13	Data access to the S-1 archive is critical. ESA should communicate the data-access implementation clearly online, and reveal how data in the long-term archive can be retrieved.	PSI and DInSAR, Cryosphere
14	ESA should provide a set of EW SLC products to assess the mode performance for InSAR.	Cryosphere, Subsidence and Landslides

5 RECOMMENDATIONS RELATED TO: S-1 OBSERVATION SCENARIO

No	Recommendation	From Session
15	ESA should produce a map/tool showing how each point on Earth (e.g. a 10x10km grid) will be interferometrically imaged in the long-term baseline mode: • Ascending/descending repeat interval. • From various tracks (adjacent overlapping). • Both for S1A and S1B separately and together. • Including a time window.	PSI and DInSAR
16	ESA should put in place a coordination forum in order to coordinate S1 observations together with the operational sea ice monitoring community.	Cryosphere
17	Coordination with other space missions, via the Polar Space Task Group, is critical to fill in gaps in S1 observations.	Cryosphere
18	For full ice sheet coverage, at least 4 IW consecutive acquisitions (12 day repeat) should be acquired to form 2 independent pairs.	Cryosphere

19	The ice sheet margin is the highest priority target. Continuous acquisition of selected tracks covering the periphery of the ice sheets should be implemented along the entire coast of Greenland, and select parts of Antarctic margin at a minimum. We would however prefer the monitoring of the entire Antarctic coast in order to detect new changes.	Cryosphere
20	ESA should establish a mechanism for deciding when increased acquisitions for seismic events should be triggered.	Earthquakes and Tectonics
21	ESA should set up a review in 6-12 months to add potential areas to existing priority masks (areas poorly defined near mask borders, large historical earthquakes..).	Earthquakes and Tectonics
22	The observation scenario should be boringly consistent: • Same mode of acquisition in both ascending and descending. • Dual-polarisation if possible.	Volcanoes
23	The observation scenario over volcanic areas should be community-driven: • Regional priorities (i.e. faster ramp-up and more frequent acquisitions in areas of highly dynamic behaviour or vegetation, such as South-East Asia volcanoes). • Procedure for adding new targets that have been overlooked in the current acquisition plan should be put in place.	Volcanoes
24	S-1 coverage should be increased: • S1 IW VV-acquisitions should be extended from South to North Alaska for permafrost studies. • Manage continued acquisitions from one selected track covering Svalbard in IW. • Subsidence phenomena in Australia should be covered. • Large parts of US and Africa are not covered. • Landslides & subsidence are going on all over the world. • Better temporal coverage over the world is required (in ascending and descending).	Subsidence and Landslides

6 RECOMMENDATIONS RELATED TO: THE ESA HISTORICAL SAR ARCHIVE

No	Recommendation	From Session
25	ESA should place all the legacy SAR data (ERS, Envisat) on an open server for free access. • This could be done through Exploitation Platforms offering processing capabilities.	Earthquakes and Tectonics
26	Some old ERS scenes that were previously processed cannot be processed to new products due to missing lines. ESA should find a work-around to save this historical data.	Earthquakes and Tectonics

7 RECOMMENDATIONS RELATED TO: FUTURE STUDIES AND R&D

No	Recommendation	From Session
27	Comparisons between ERS/Envisat and S-1 InSAR coherences should be performed to understand what is potentially gained using S-1.	Coherence Exploitation
28	Study the use of cheap reference point transponders for S-1 application projects.	InSAR Theory
29	Investigate and possible exploit the lack of phase closure in interferograms that is an indicator of asymmetric volumetric profiles.	InSAR Theory
30	ESA should investigate the options to come to a common/shard data format for Time Series InSAR results, including metadata.	PSI and DInSAR
31	ESA should initiate and coordinate a benchmark/validation study to compare (PSI and DInSAR) processing results of various groups, over various landscapes (arid, cryosphere, urban, vegetated, rugged, flat etc.). Level-2 products, such as deformation maps, should be analysed, evaluated, and made publicly available for future reference. • Study like PSIC4/Terrafirma • ESA should start the discussion what should be validated: Processing chains? Products? Data? • For subsidence-monitoring a suggested test-case is Mexico city. • Validation should be performed in Europe.	PSI and DInSAR, Subsidence and Landslides
32	ESA should investigate the “business-case” of a potential Wide-Area Product (WAP). Who is the “user”? • WAP proposed as a new operational service, ESA should support this initiative when proposed to EC level.	PSI and DInSAR
33	A training course should be organised targeted for a new generation of EO students in cryospheric applications and services.	Cryosphere
34	For future missions, ESA should study concepts that allow for higher resolution than current TOPS – for example SweepSAR.	Volcanoes
35	ESA should better promote the exploitation of “Geohazards-TEP” for the subsidence and landslides community.	Subsidence and Landslides