5.1 Real Time snow reporting: BUFR Templates, registration as GCW stations, monitoring progress and outreach

Patricia de Rosnay and Sam Pullen

Snow Watch meeting
UQAM, Montreal, 17-19 July 2019

ECMWF

rnational exchange of snow data

IO EC-69 (2017), Abridged final report with resolutions and decisions
//library.wmo.int/index.php?lvl=notice_display&id=19919#.W4AgERZG1e5

Resolution 15 on international exchange of snow data

..zero snow depth (absence of snow) should be reported … ”

Requests Members to exchange in situ snow measurements in real time in BUFR through the Globa
elecommunication System …”

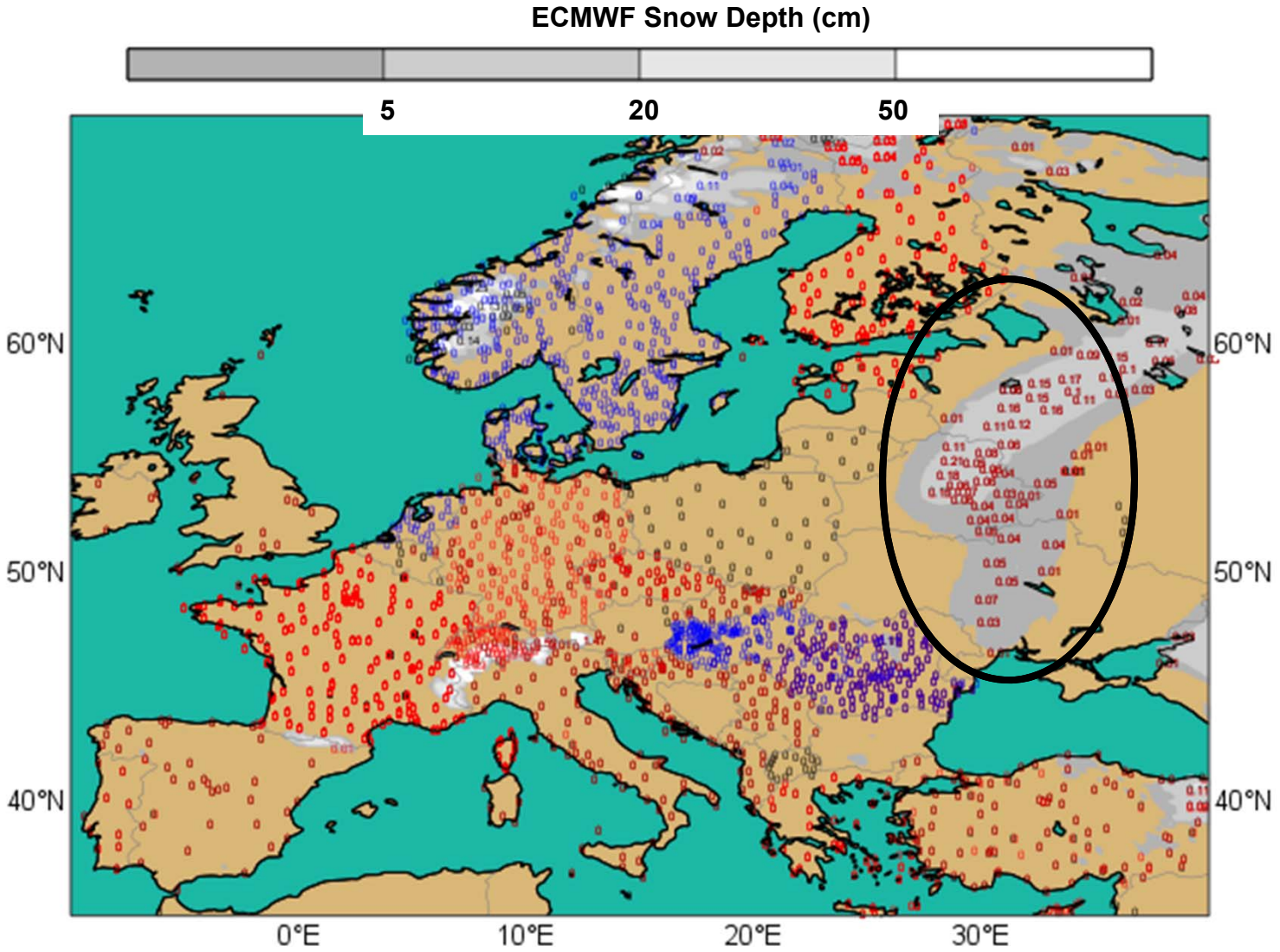
SNOTEL, COOP, SCAN data on the GTS (NOAA) with support from ECMWF & SnowWatch, WM
ution 15 used in support of required resources at NOAA (Sept 2018) – Role of GODEX (Global Obs
ange). Next meeting (webex) Sept 2019

Snow Observations

Snow SYNOP and National Network data in Europe

data
le on the GTS
C SYNOP
FR SYNOP
onal data

11 15 at 06UTC



ow reports from Ukraine

raine increased number of stations from 30 to more than 160, using BUFR SYNOP.
ed in operations since June 2018 at ECMWF

https://www.ecmwf.int/en/about/media-centre/news/2018/extra-weather-station-data-improve-ecmwfs-forecasts

ow reports from Bulgaria (NIMH)

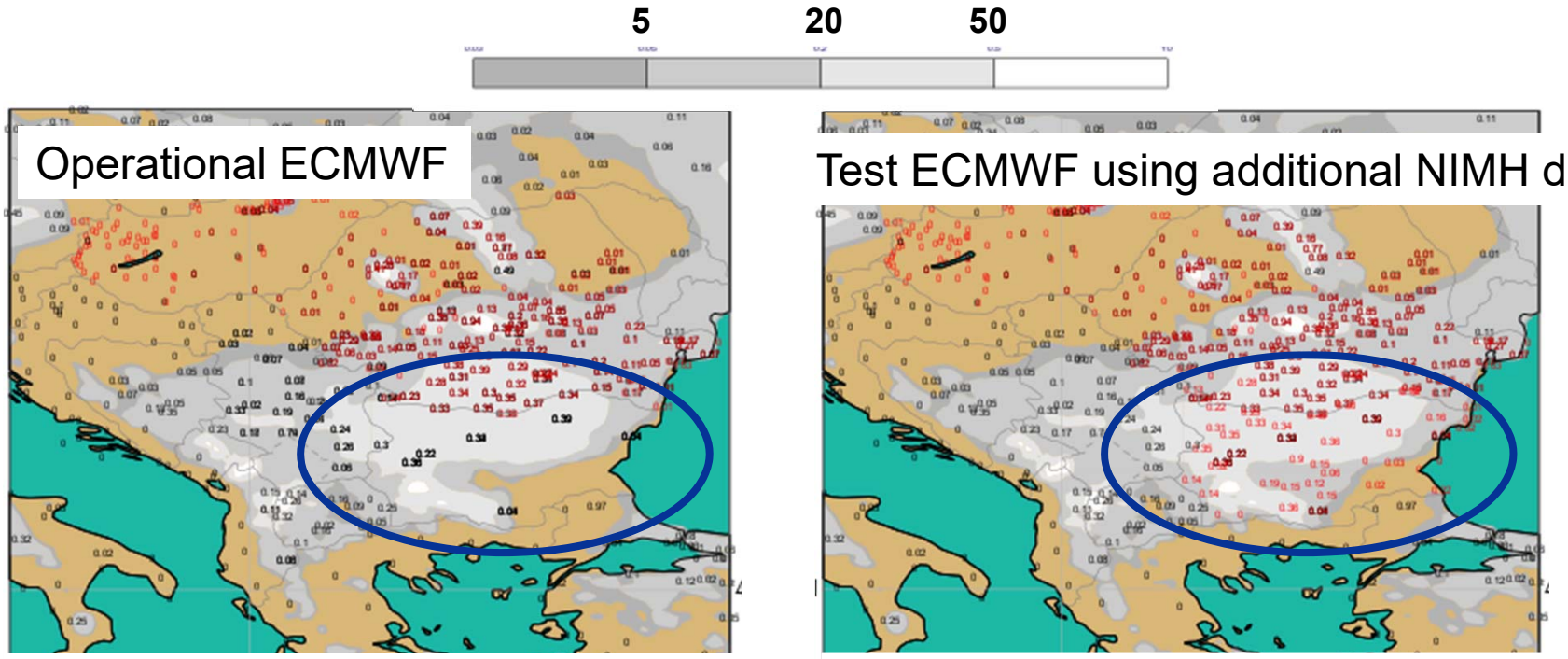
Snow COST action ES1404 →contribute to improve in situ data exchange for NWP

H: 39 additional stations (BUFR format, routinely produced)

WF data acquisition, 1-month assimilation test

ble for operational use

anuary 2016
w depth in cm



Lack of observations in Bulgaria

39 more stations provided by NIMH

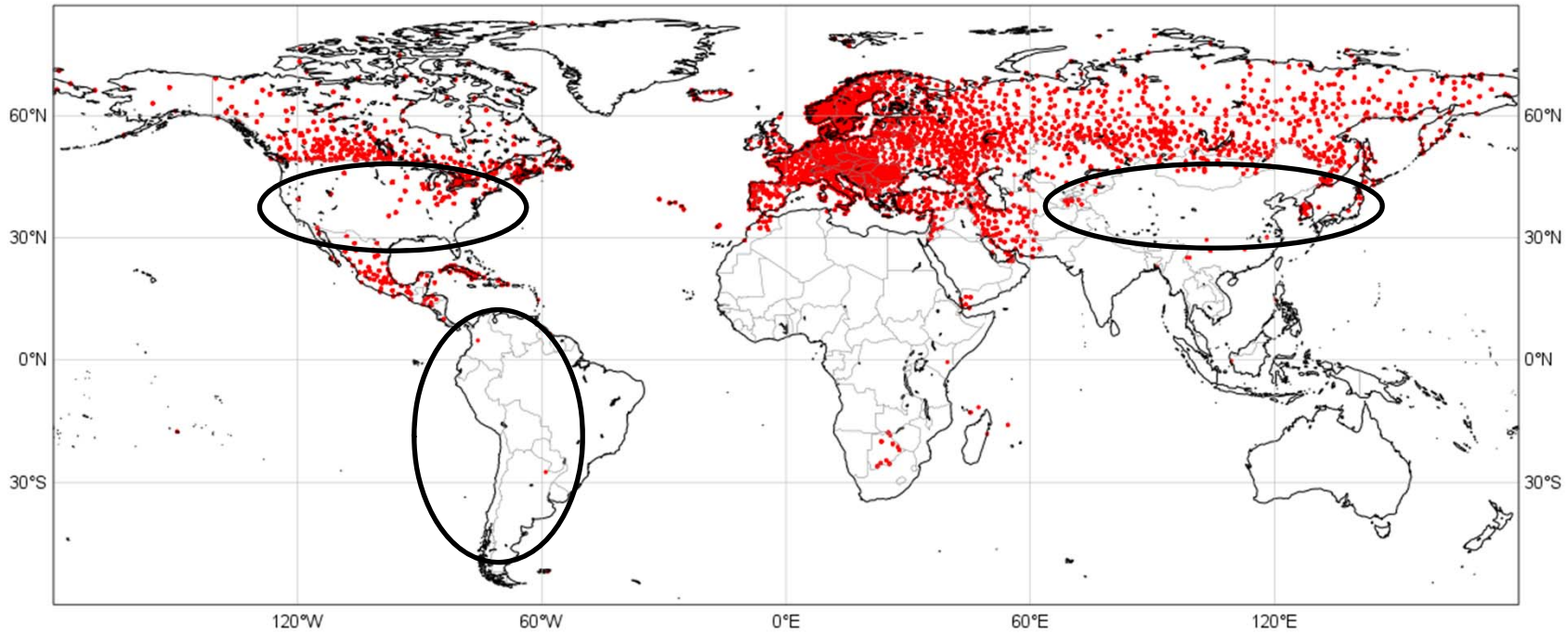
y et al.,
3 2016

In situ snow depth observations

GTS Snow depth availability

SYNOP TAC + SYNOP BUFR + national BUFR data

Status on 10-15 December 2013



In situ snow depth observations

GTS Snow depth availability

SYNOP TAC + SYNOP BUFR + national BUFR data

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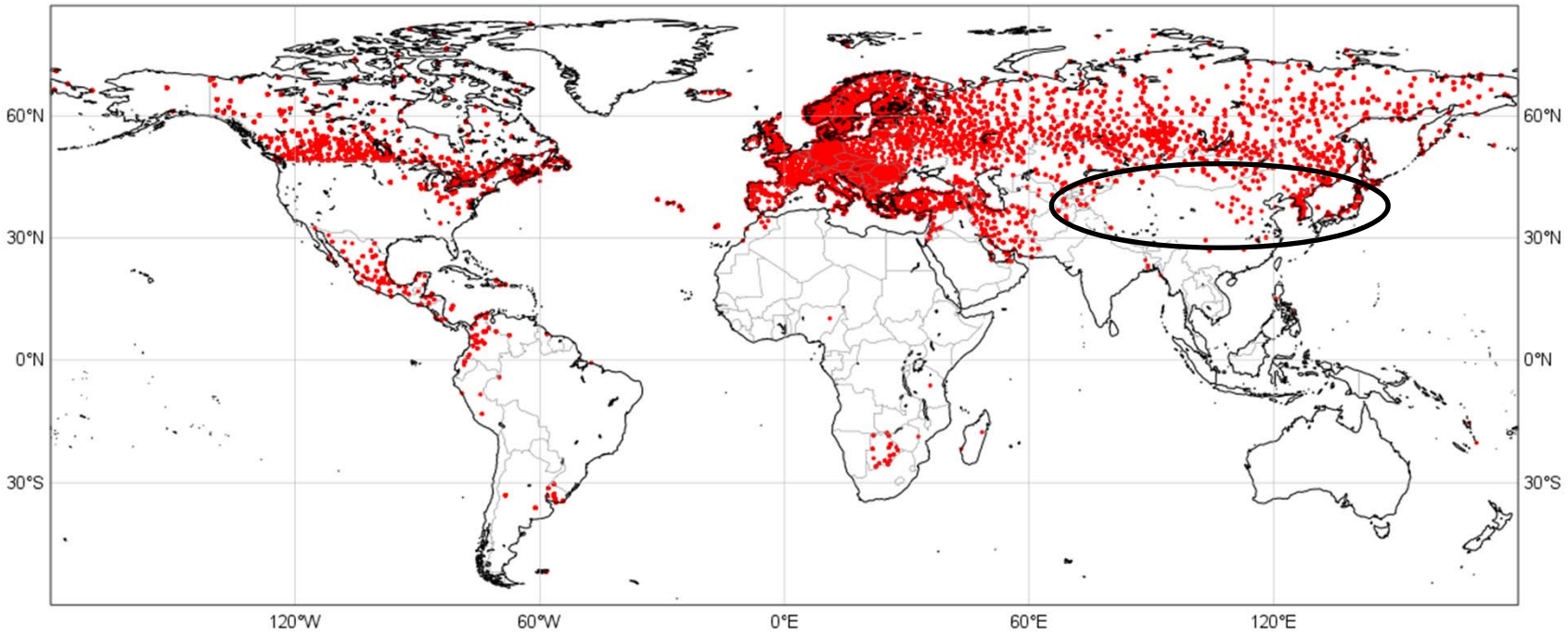
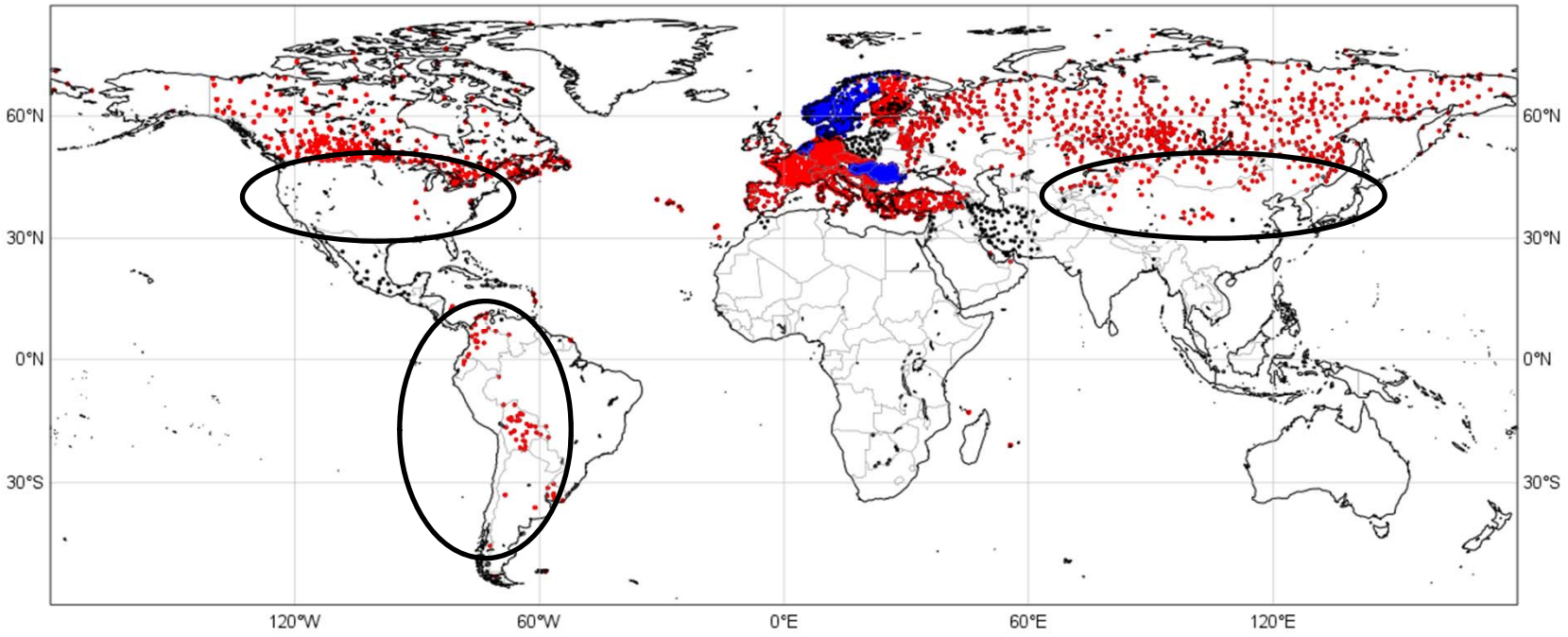


In situ snow depth observations

GTS Snow depth availability

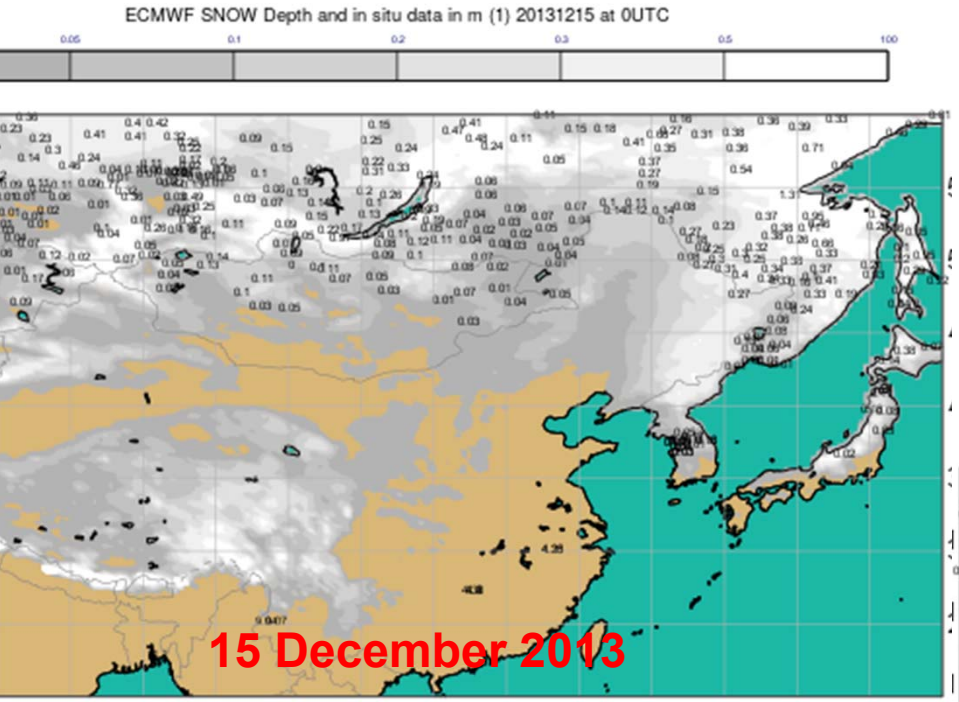
SYNOP TAC **SYNOP BUFR** **national BUFR data**

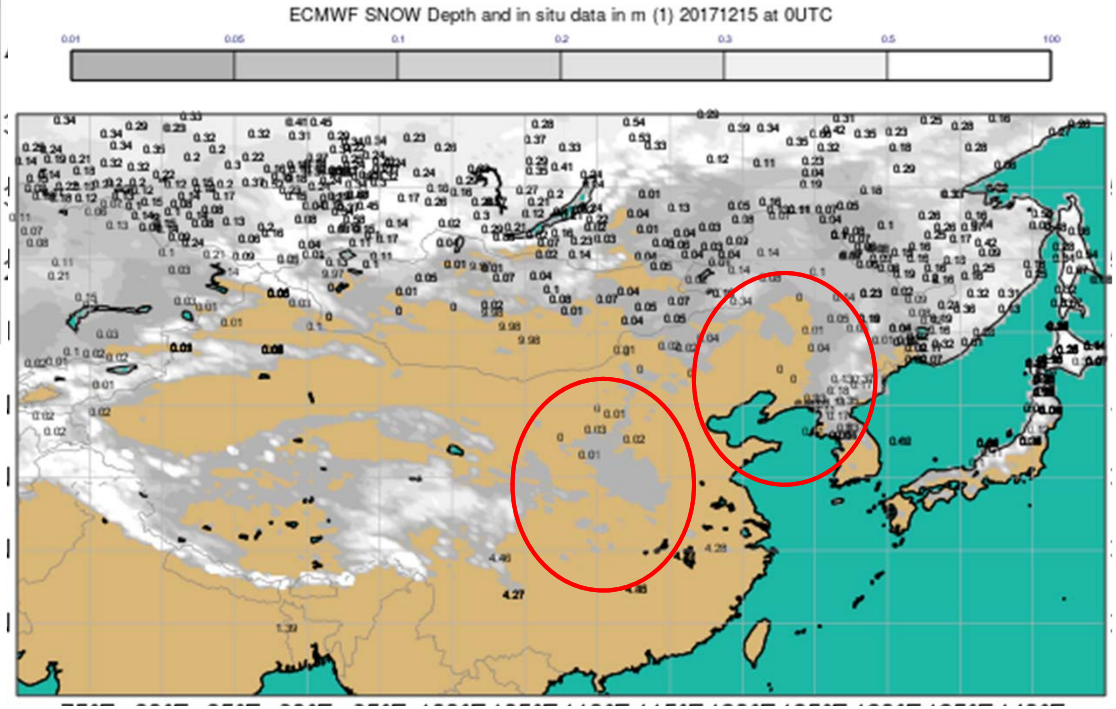
Status on 15 November 2018



In situ snow depth observations

GTS Snow depth availability





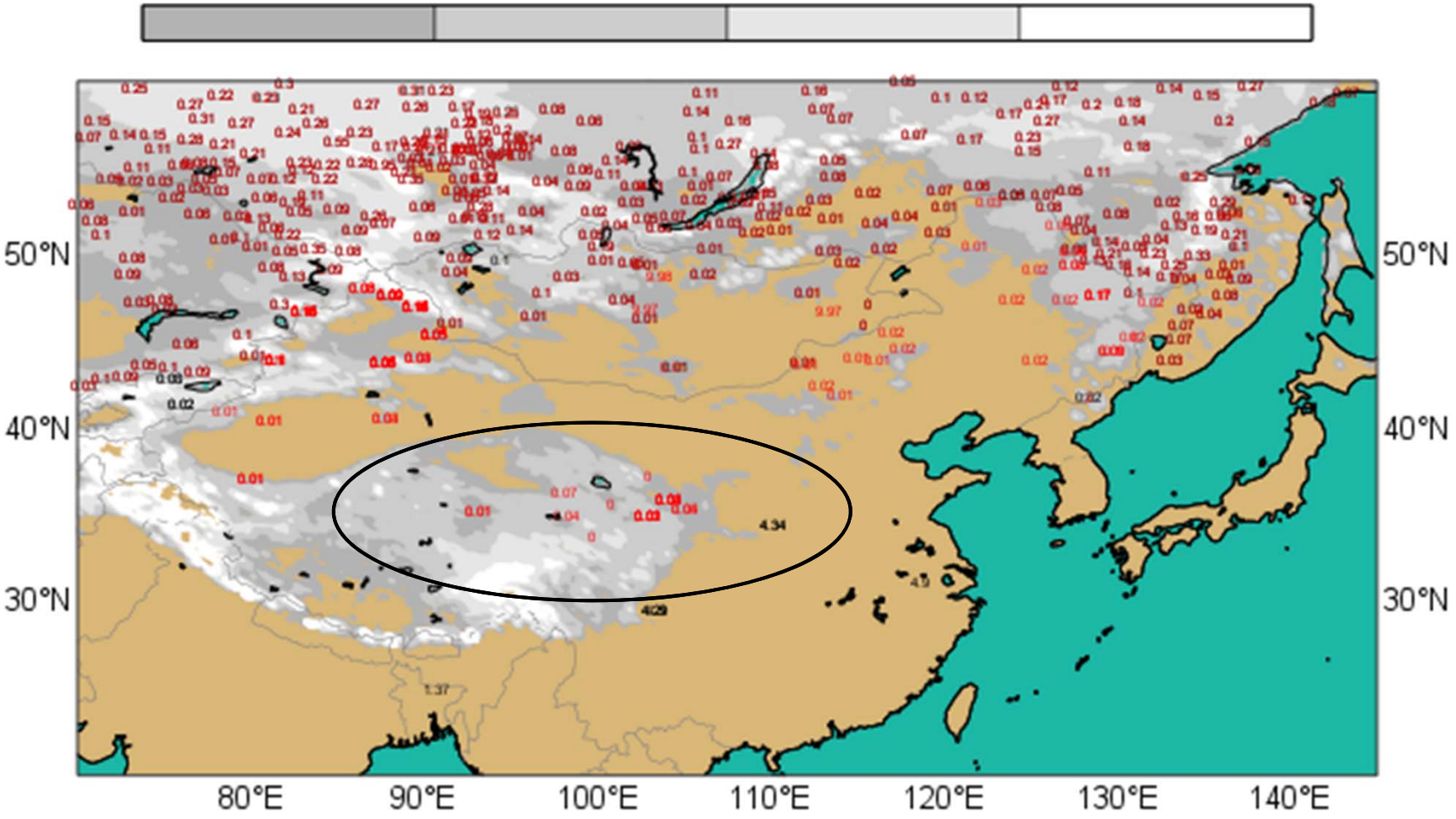
Improvement in China: About 200 new stations reporting (in snow conditions) in SYNOP BUFR

15 December 2017

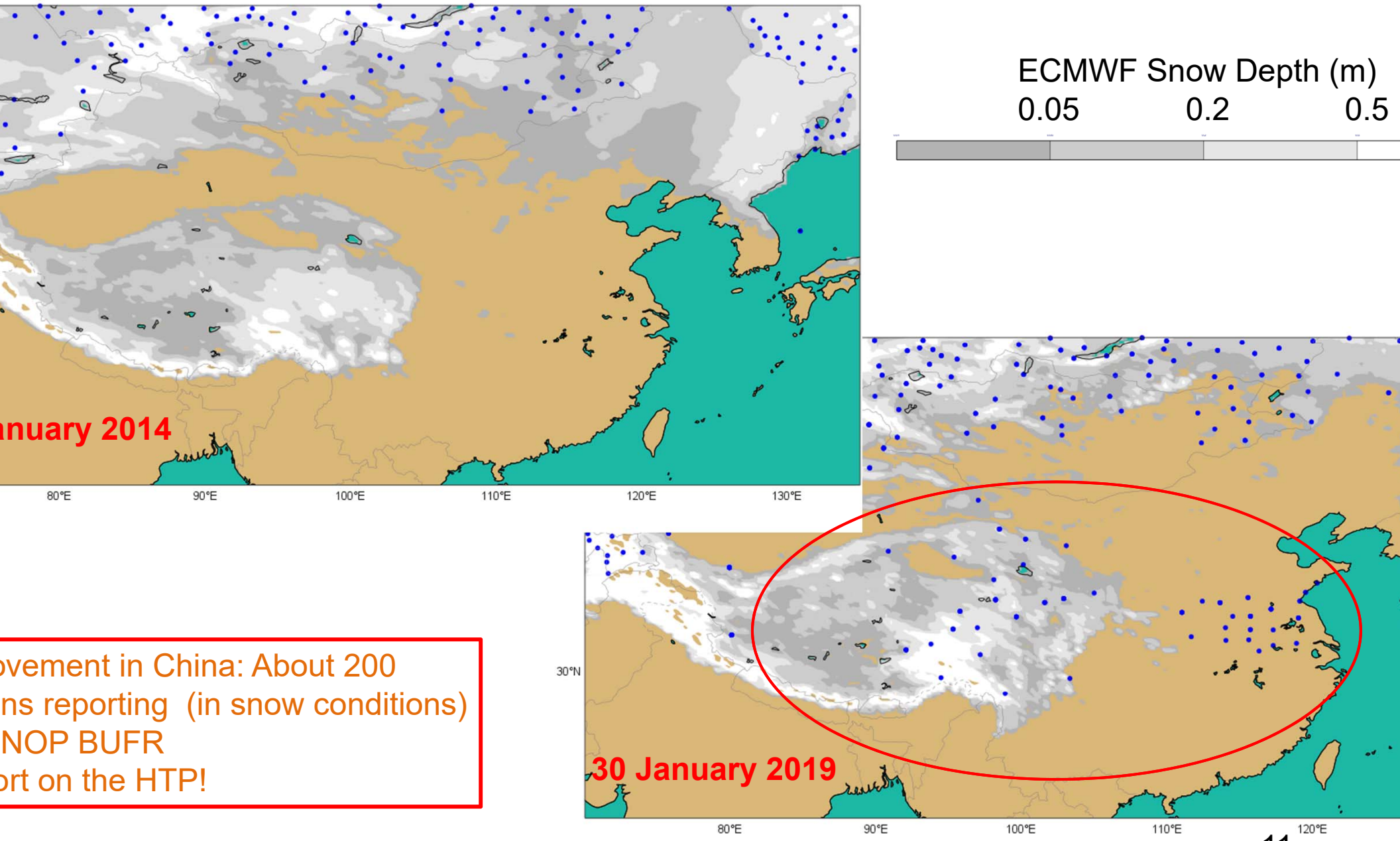
In situ snow depth observations

GTS Snow depth availability

15 November



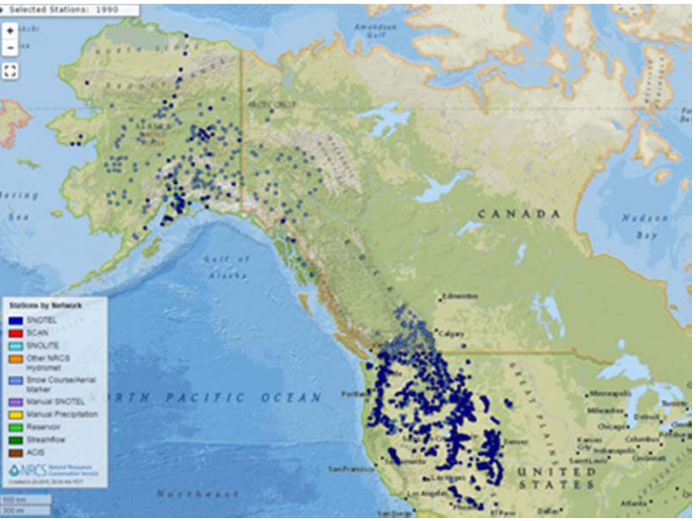
CMA in situ snow depth observations on the GTS



ovement in China: About 200
ns reporting (in snow conditions)
NOP BUFR
ort on the HTP!

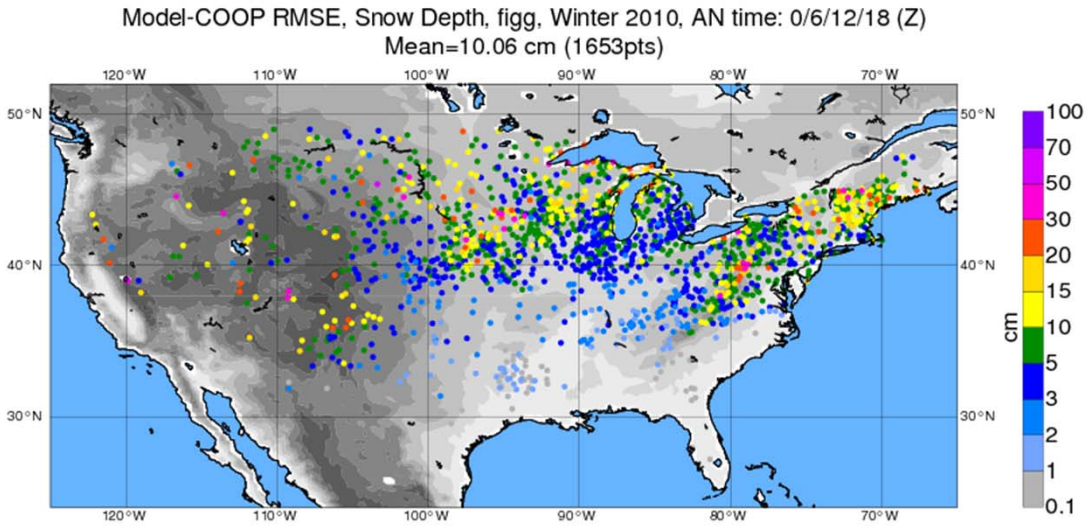
In situ snow depth observations in the US

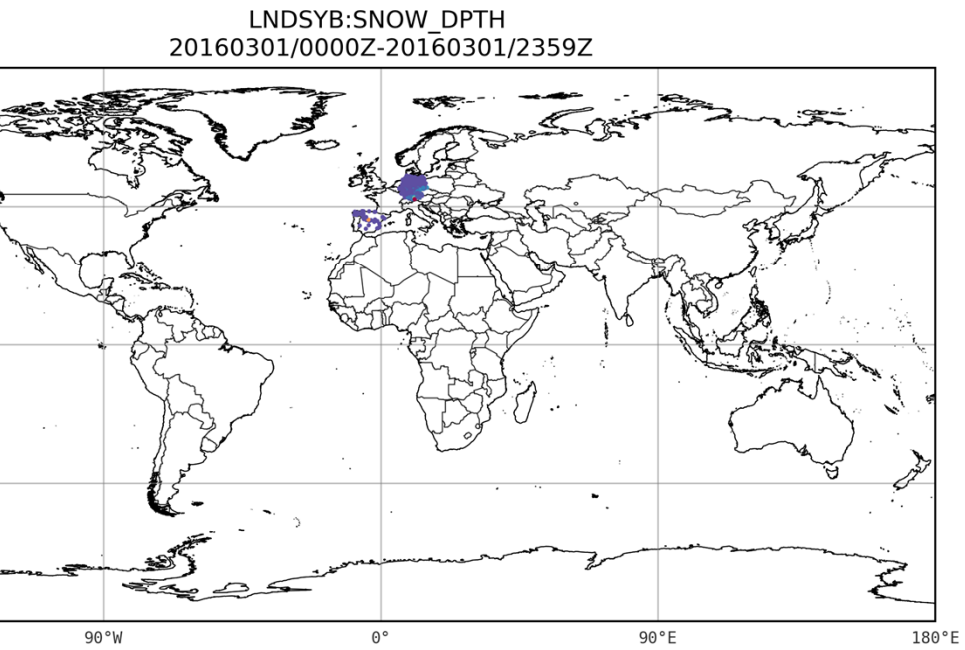
NOTEL (Snow Telemetry) network

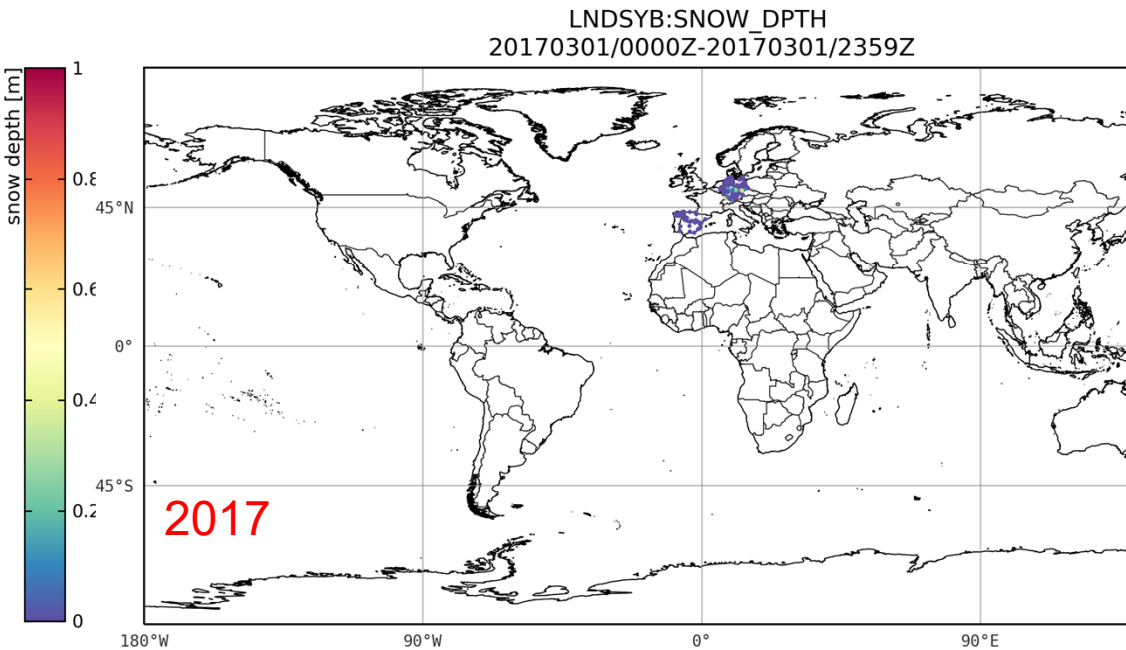


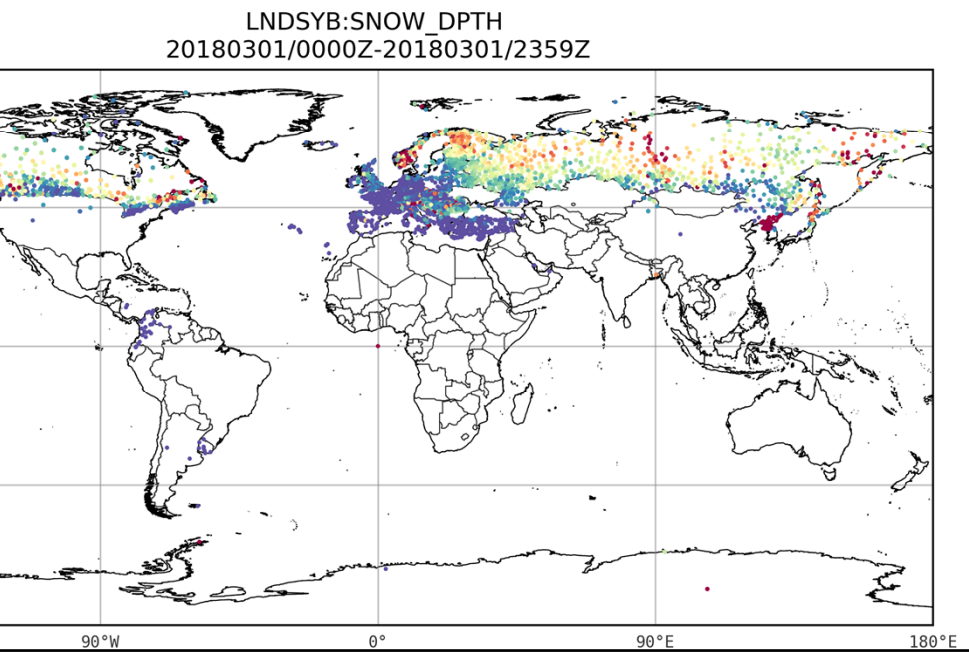
ex meeting in November in India (Ioannis
as and Lars Isaksen from ECMWF
nded)
t Godex meeting: webex in September
st: NOAA and US institutions committed
rovide data on the GTS

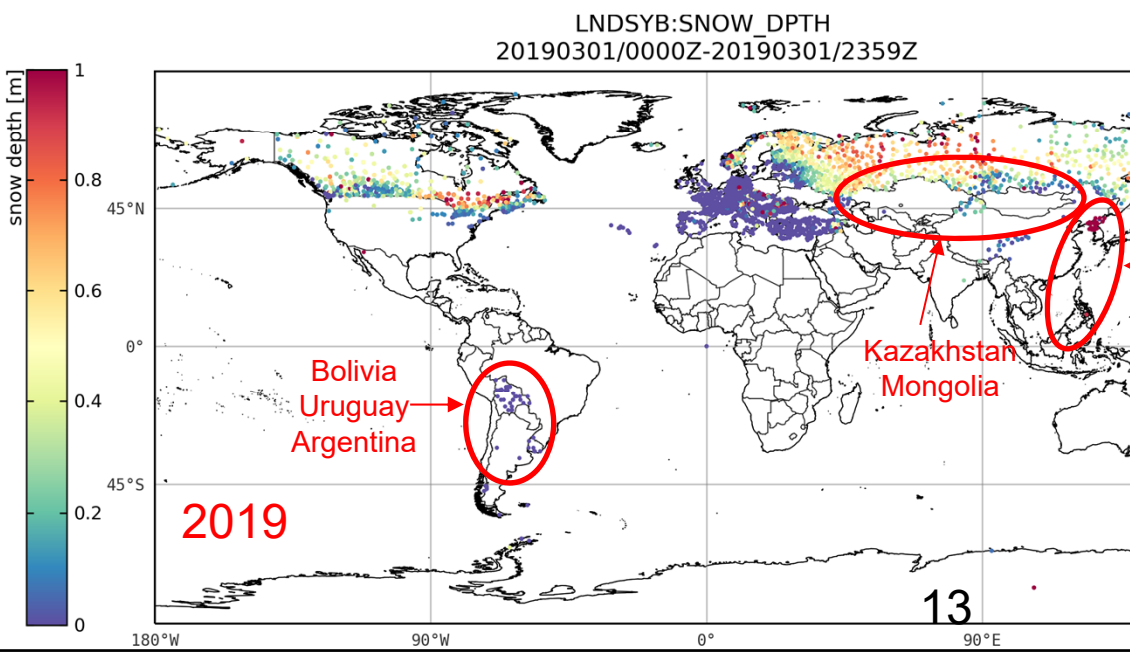
Other networks, inc. National Weather Service Cooperative Observer Program (COOP), or Soil Climate Analysis Network (SCAN) that provide thousands of stations

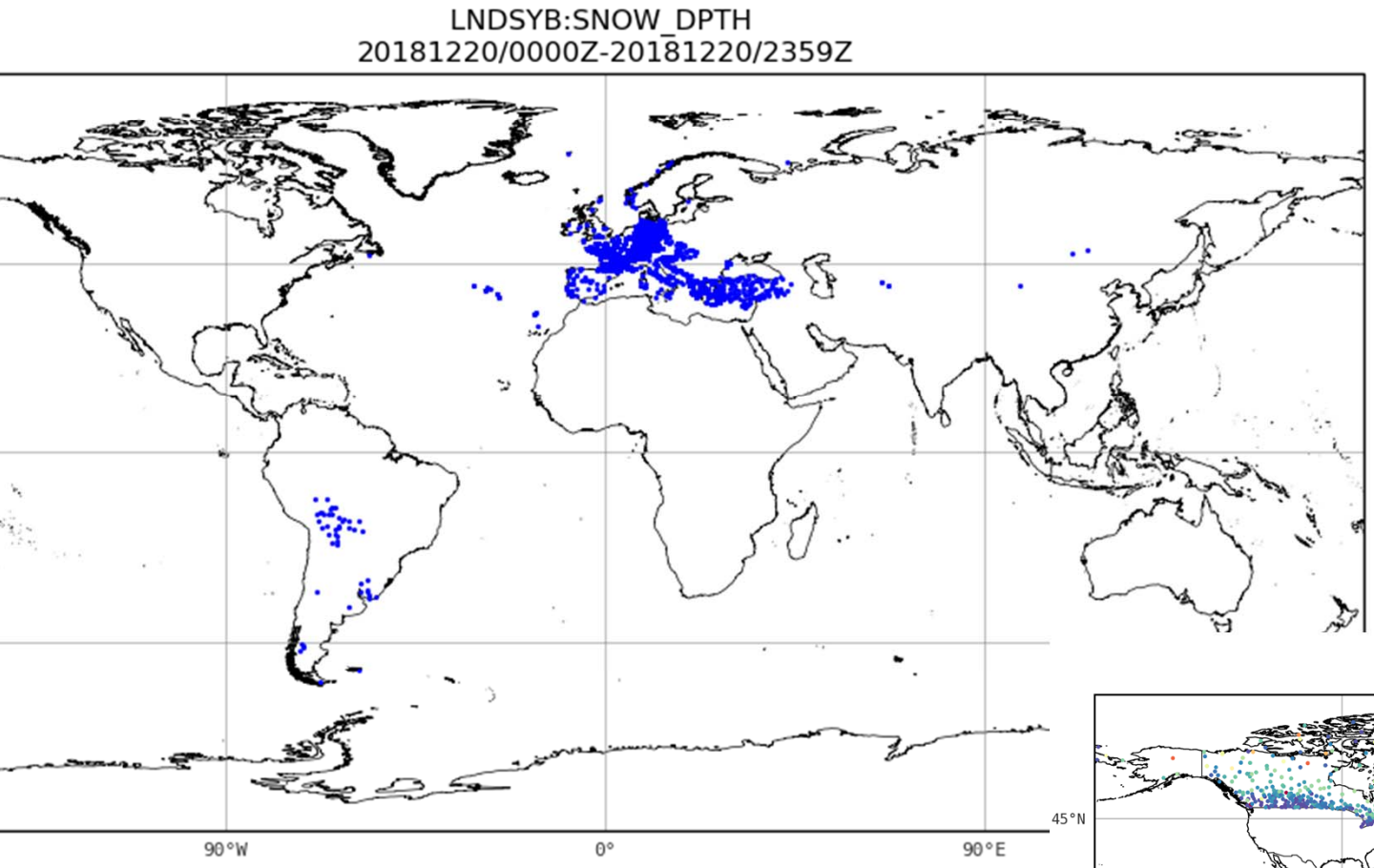



LNDSYB:SNOW_DPTH
20160301/0000Z-20160301/2359Z
90°W
0°
90°E
180°E


LNDSYB:SNOW_DPTH
20170301/0000Z-20170301/2359Z
snow depth [m]
1
0.8
0.6
0.4
0.2
0
45°N
0°
45°S
2017
180°W
90°W
0°
90°E


LNDSYB:SNOW_DPTH
20180301/0000Z-20180301/2359Z
90°W
0°
90°E
180°E

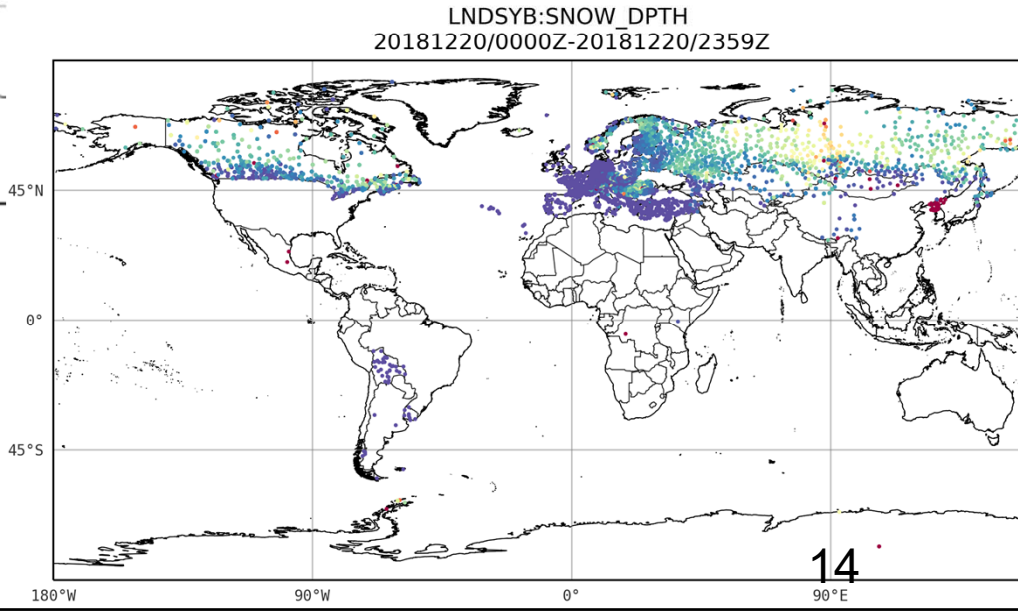

LNDSYB:SNOW_DPTH
20190301/0000Z-20190301/2359Z
snow depth [m]
1
0.8
0.6
0.4
0.2
0
45°N
0°
45°S
Bolivia
Uruguay
Argentina
Kazakhstan
Mongolia
2019
180°W
90°W
0°
90°E

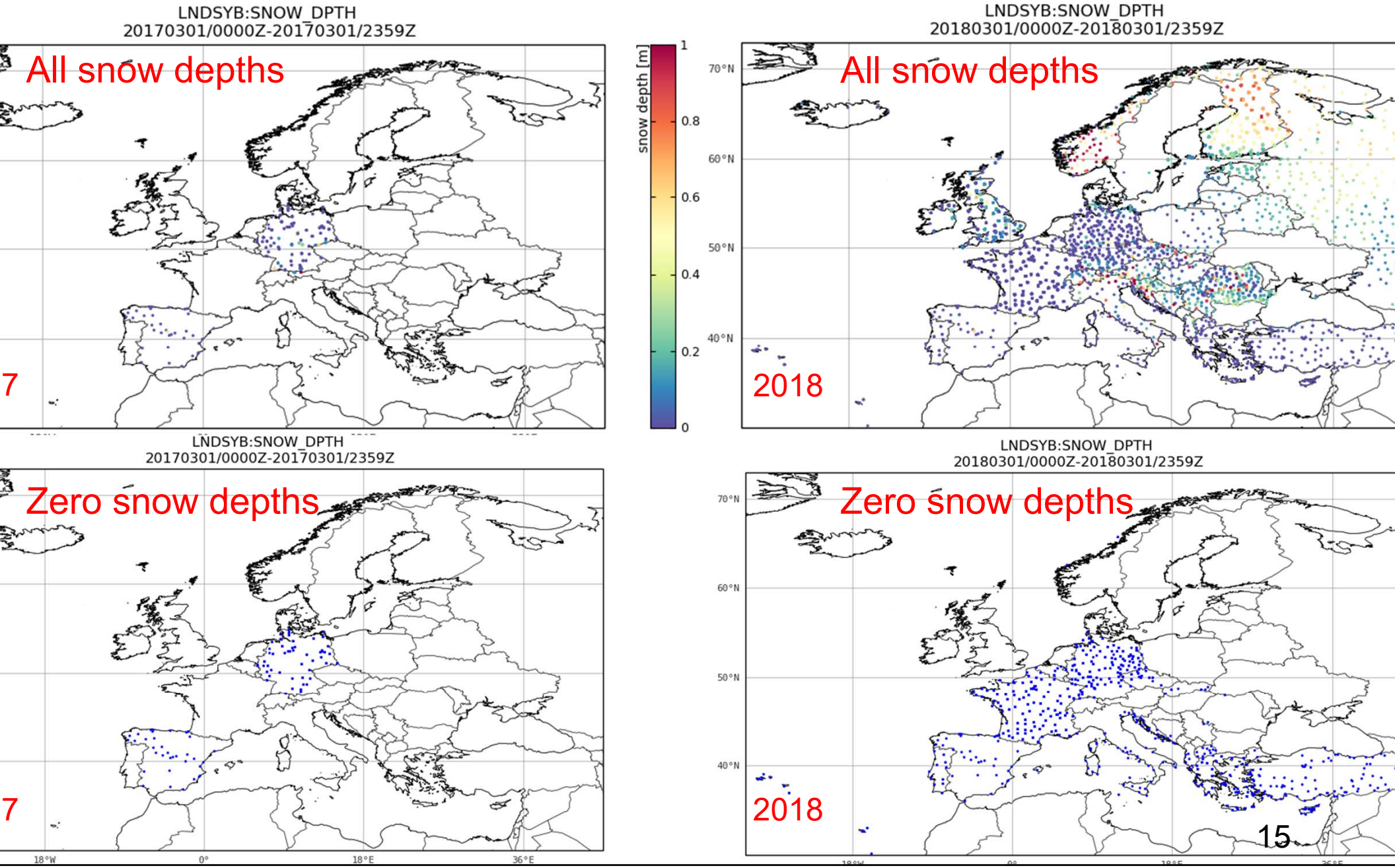


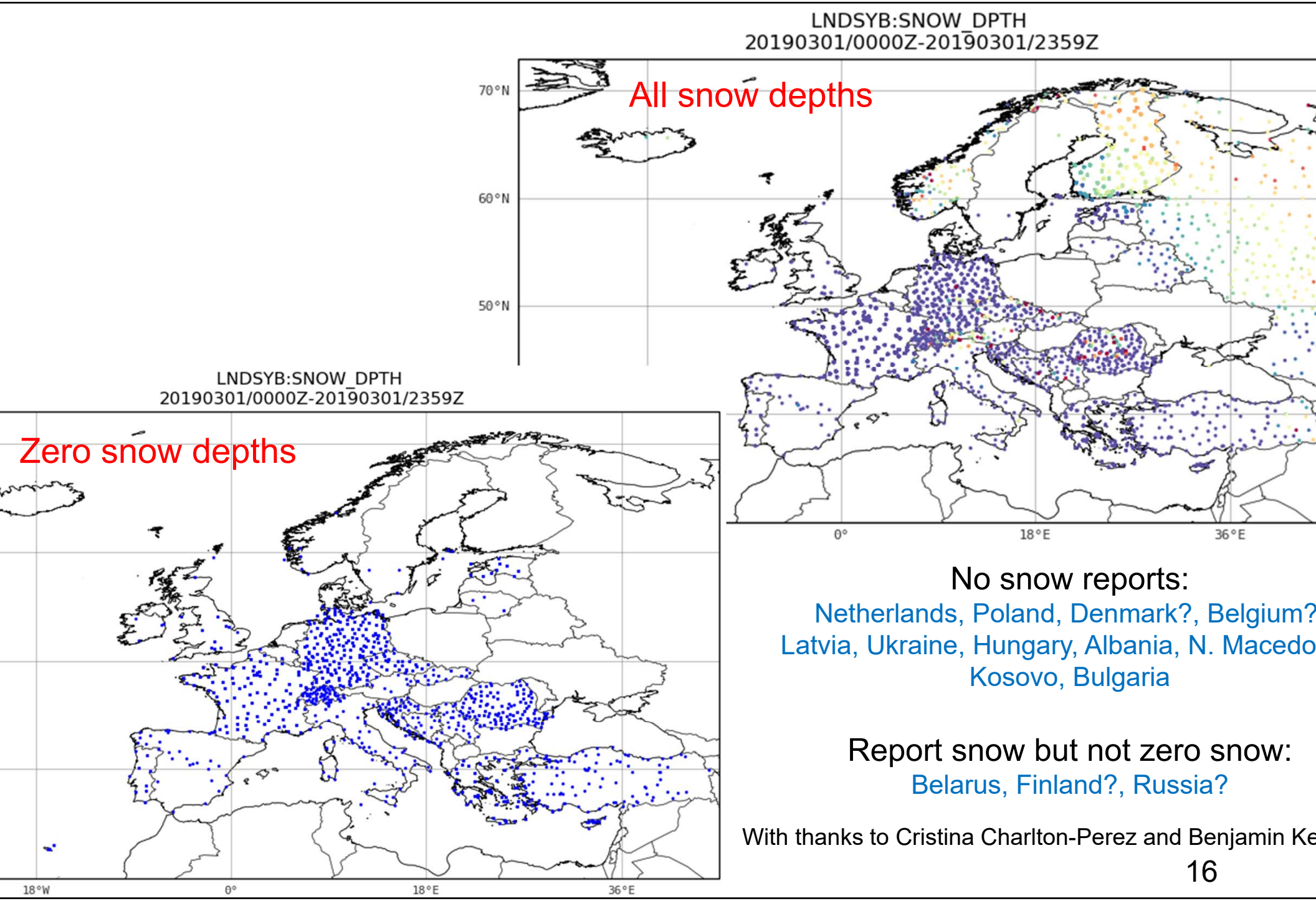
December 2018

Good uptake in Europe

Some in China, S. America




LNDSYB:SNOW_DPTH
20170301/0000Z-20170301/2359Z
All snow depths
7
LNDSYB:SNOW_DPTH
20180301/0000Z-20180301/2359Z
All snow depths
2018
snow depth [m]
1
0.8
0.6
0.4
0.2
0
70°N
60°N
50°N
40°N
LNDSYB:SNOW_DPTH
20170301/0000Z-20170301/2359Z
Zero snow depths
7
LNDSYB:SNOW_DPTH
20180301/0000Z-20180301/2359Z
Zero snow depths
2018
18°W
0°
18°E
36°E



No snow reports:

Netherlands, Poland, Denmark?, Belgium?
Latvia, Ukraine, Hungary, Albania, N. Macedo
Kosovo, Bulgaria

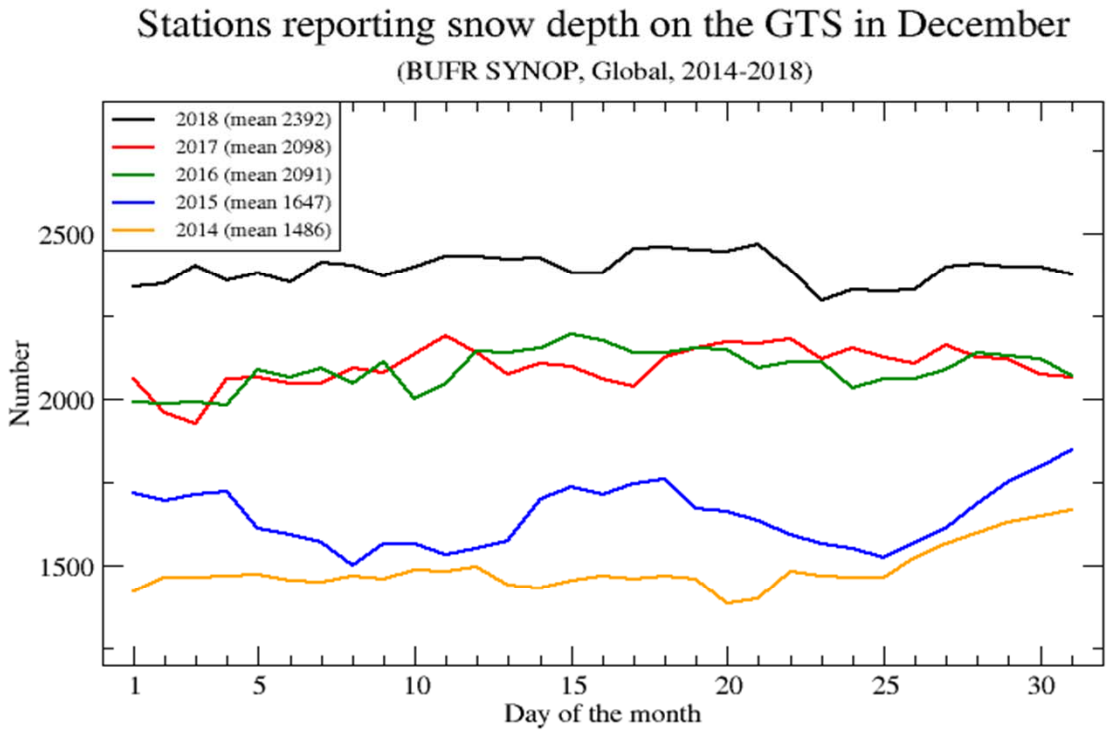
Report snow but not zero snow:

Belarus, Finland?, Russia?

With thanks to Cristina Charlton-Perez and Benjamin Ke

In situ snow depth observations
GTS Snow depth availability

Rosnay and Nitu)



Increase in available snow depth data from distinct SYNOP stations reporting in BUFR SYNOP on GTS, for the month of December of each year, from 2014 to 2018.

rnational exchange of snow data

MO EC-69 (2017), Abridged final report with resolutions and decisions

//library.wmo.int/index.php?lvl=notice_display&id=19919#.W4AgERZG1e5

Resolution 15 on international exchange of snow data

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waiting: US SNOTEL, COOP, SCAN data on the GTS (NOAA) with support from ECMWF & wWatch, WMO resolution 15 used in support of required resources at NOAA (Sept 2018) – Role of DEX (Global Obs data Exchange). Next meeting (webex) Sept 2019

/E in BUFR (2018): for NRT exchange of SWE data via GTS

ET-CM = Inter-programme expert team on code maintenance

w SWE BUFR approved May2018: http://www.wmo.int/pages/prog/www/ISS/Meetings/IPET-I_Offenbach2018/IPET-CM_DocPlan.html

ailable to WMO MSs November 2018

esented at ECMWF TAC (Tech. Adv. Committee) in October 2018

esented at the IPET-SUP/GODEX meeting this week (India)

GCW Snow Watch actions
International exchange of snow data
Snow Water Equivalent BUFR

TEOROLOGICAL ORGANIZATION
SSION FOR BASIC SYSTEMS

SECOND MEETING OF
ROGRAMME EXPERT TEAM ON
CODES MAINTENANCE

GERMANY, 28 MAY - 1 JUNE 2018

IPET-CM-II / Doc. 2.4 (4)
09.05.2018

ITEM 2.4

ENGLISH ONLY

MANUAL ON CODES: TABLE-DRIVEN CODE FORMS
FM 94 BUFR/FM 95 CREX

w BUFR sequence for Snow Water Equivalent (SWE)

Marijana Crepulja, Enrico Fucile and Patricia de Rosnay, all from (ECMWF)

ed on the existing 3-07-101
w observation) by adding the
OS Station Identifier and the
ired elements to report the
w Water Equivalent

WE: model prognostic variable
Relevant for data assimilation
Long term benefit for operational
NWP & hydrology

→ New BUFR sequence 3 07 103 & corresponding BUFR table B entries and code

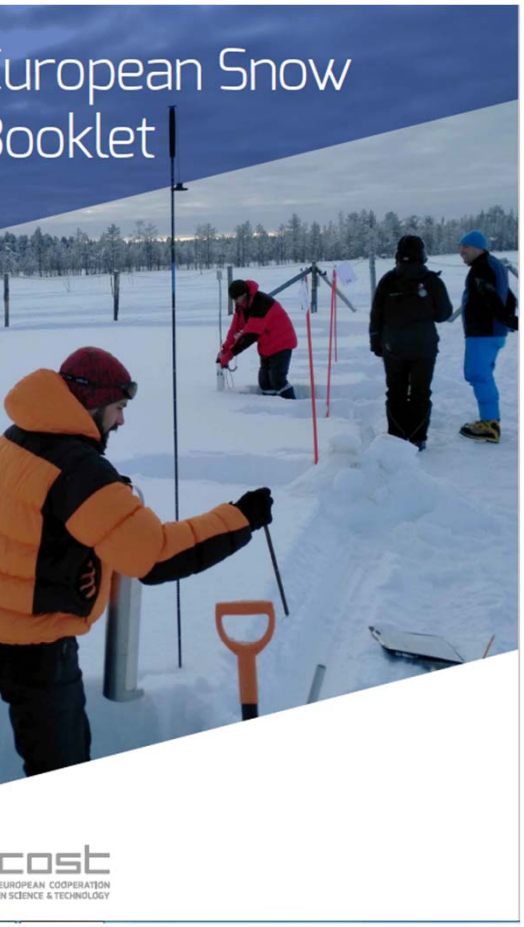
TABLE REFERENCE F X Y	TABLE REFERENCES	ELEMENT NAME
3 07 103		(Snow observation, snow density, snow water equivalent)
	3 01 150	WIGOS identifier
	3 07 101	Snow observation
	0 13 117	Snow density
	0 03 028	Method of snow water equivalent measurement
	0 13 163	Snow water equivalent

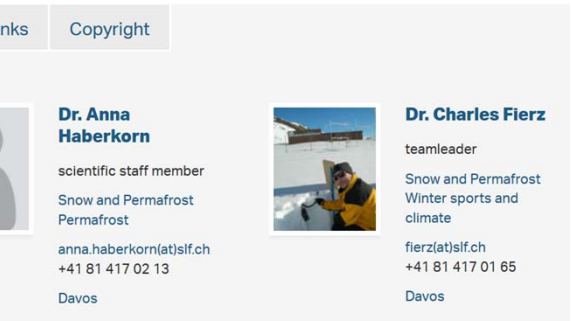
Code table 0 03 028 – Method of Snow Water Equivalent Measurement

Code figure	
0	MULTI POINT MANUAL SNOW SURVEY
1	SINGLE POINT MANUAL SNOW WATER EQUIVALENT MEASUREMENT
2	SNOW PILLOW OR SNOW SCALE
3	PASSIVE GAMMA
4	GNSS/GPS METHODS
5	COSMIC RAY ATTENUATION
6	TIME DOMAIN REFLECTOMETRY
7-62	Reserved
63	Missing

MWF

T Actions: HarmoSnow (2014-2018)





- Aim: To enhance the capability of the research community and operat services to provide and exploit quality-assured and comparable regio and global observation-based data on the variability of the state and extent of snow.
- 13 workshops, 21 meeting, 3 field campaigns, 1 training school, 8 publications and support to the European snow booklet
- Web: WWW.HARMOSNOW.EU

COST Actions: EuroSnow (in prep)

Aim of EuroSnow

- Strength the established network of snow information providers an
- Coordinate the process of the utilization of snow information throug measurement via assimilation into numerical models and user-orie products on European level
- Assisting community sections affected by snow related hazards an extreme events.

Contact: Leena Leppänen (leena.leppanen@fmi.fi)

ellite inspired hydrology in an uncertain
ure: an H SAF and HEPEX workshop

and all Collapse all

WF | Reading | 25-28 November 2019

www.ecmwf.int/en/learning/workshops/satellite-
d-hydrology-for-an-uncertain-future

9th EARSeL workshop on Land Ice and Snow

Remote Sensing of the Cryosphere: Monitor what is vanis

03 - 05 February 2020, Bern, Switzerland

Call for Papers

You are cordially invited to attend the 9th Workshop on Remote Sensing of Lan
of the European Association of Remote Sensing Laboratories (EARSeL), which
the Institute of Geography, University of Bern, Switzerland, from **03 - 05 February**

Bern – capital of Switzerland and UNESCO world heritage

http://www.earsel.org/SIG/Snow-Ice/workshop/

pecial Issue "Remote Sensing of Land Surface and Earth System odelling"

https://www.mdpi.com/journal/remotesensing/special_issues_Surface_Earth_System_Modeling

- Special Issue Editors
- Special Issue Information
- Keywords
- Published Papers

special issue of *Remote Sensing* (ISSN 2072-4292). This special issue belongs to the section Biogeosciences Remote Sensing".

eadline for manuscript submissions: **30 June 2020**.

nd surface data assimilation
nd surface re-analysis
nd surface forward modelling (VIS/IR/MW),
erse modelling and machine learning
nd surface parameter retrieval
upled assimilation (land-hydrology-atmosphere)
ercomparison (model and DA)

Special Issue Editors

Guest Editor
Dr. Patricia De Rosnay
European Center For Medium-Range Weather Forecasts, UK
Website | E-Mail
Interests: Land surface data assimilation; coupled assimilation; Earth system modelling; Land surface observations; Forward modelling

Guest Editor
Dr. Clement Albergel
Affiliation: Météo-France/ Centre National de Recherches Météorologiques (CNRS), France
Website | E-Mail
Interests: land surface modelling; climate change; hydrology; data analysis

Guest Editor
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Website | E-Mail
Interests: land surface modelling; hydrology; data assimilation; remote sensing; Optimization