

Validation of NOAA Interactive Snow Maps with National Climatic Data Center (NCDC) and Environment Canada (EC) Ground-based Data



National Oceanic and Atmospheric Administration
Cooperative Remote Sensing Science and Technology Center

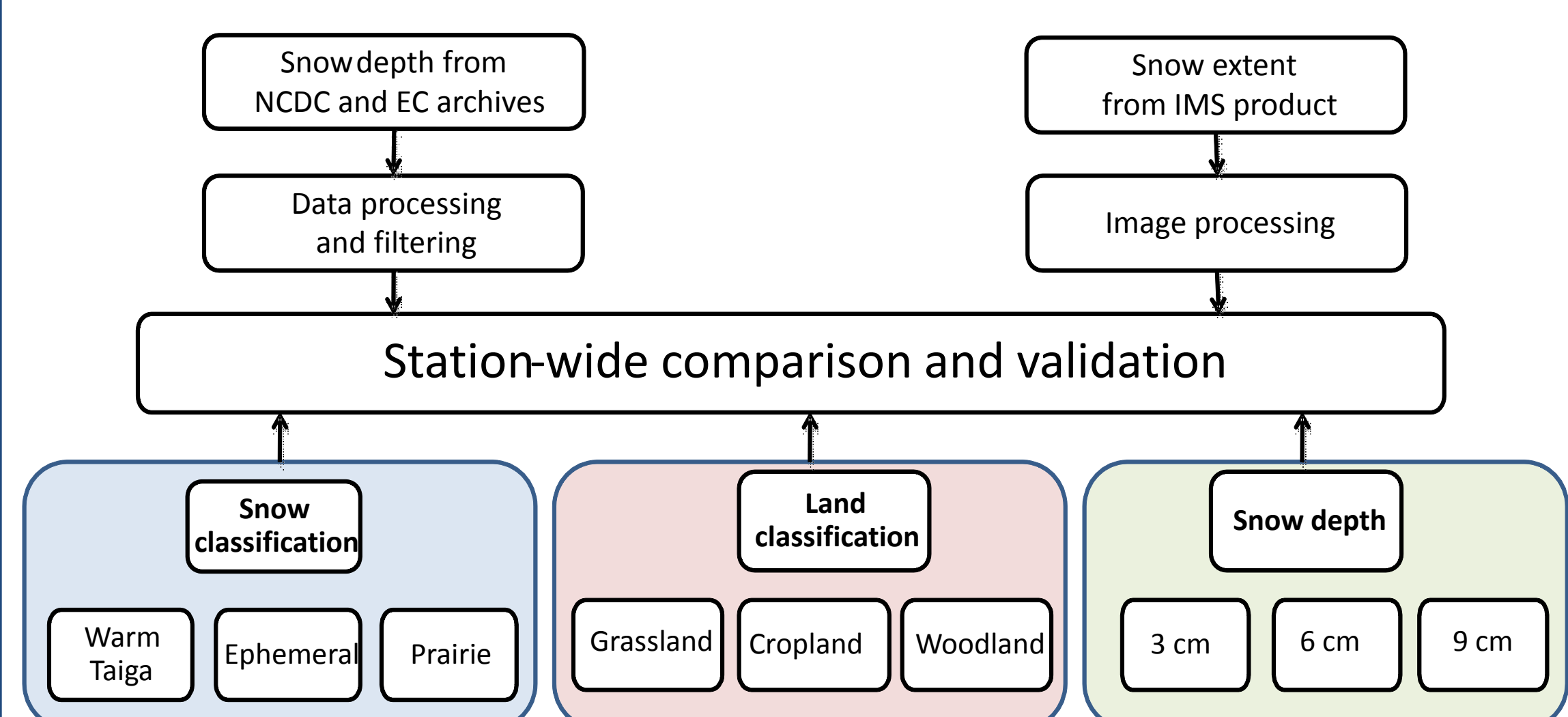
NOAA/CREST

Christine Chen, Tarendra Lakhankar, Peter Romanov, and Reza Khanbilvardi
NOAA-Cooperative Remote Sensing Science and Technology Center (NOAA-CREST), The City College of New York,
Phone: 646 269 6461 E-mail: cchen18@ccny.cuny.edu

Introduction

The interactive multisensory snow and ice mapping system (IMS) was developed to increase the accuracy and time to completion of daily snow maps constructed by NOAA analysts. Its images of the Northern Hemisphere are a result of multiple satellite and satellite-related inputs within the visible and infrared region of the electromagnetic system.

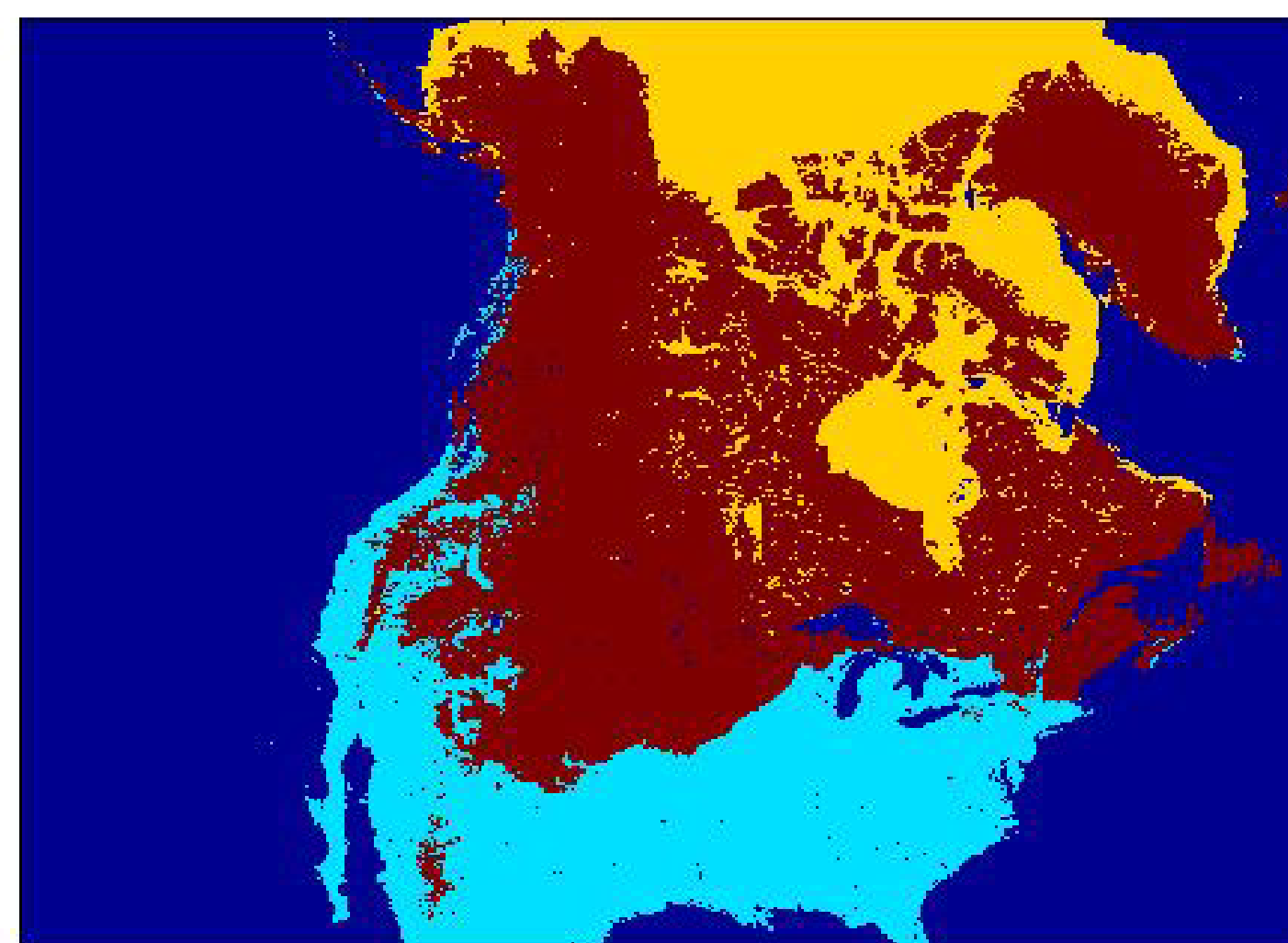
The daily snow coverage record of the North American region of NOAA's interactive multisensory snow and ice mapping system (IMS) product, is compared to the daily National Climatic Data Center (NCDC) and Environment Canada (EC) snow depth archives of the North American region. The study area consists of the American and Canadian regions between 30 to 60 degrees North latitude and between 60 to 140 degrees West longitude. Upon the confirmation of geographical correspondence between the two maps on a given day, the maps are analyzed for statistics of correspondence in areas such as snow classification, land classification and snow depth.



The results of this study will improve understanding of the strengths and limitations of the IMS snow product and may be used to aid IMS product development through its exploration of the validation of NOAA/NESDIS' interactive snow maps with NCDC and EC ground-truth data.

NOAA IMS Product

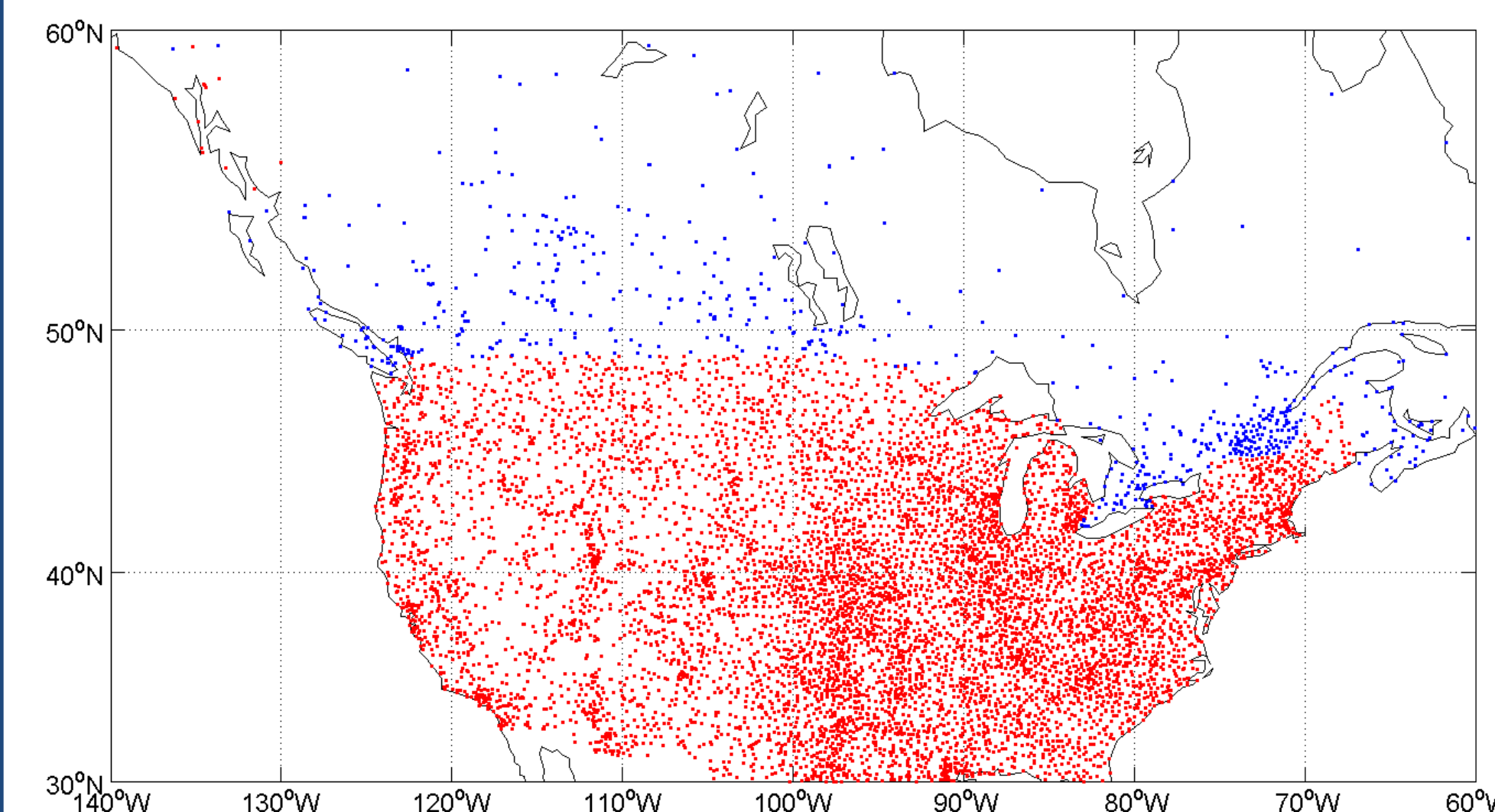
- NOAA's interactive multisensory snow and ice mapping system (IMS) is a tool to detect the presence of snow or sea ice on a daily basis.
- Since its inception in 1997, it has been continuously upgraded. Improvements include:
 - additional input sources to the product
 - improved output resolution from 24 km to 4 km
- Source material to the IMS system includes:
 - satellite imagery (e.g. AVHRR, SSM/I)
 - derived imagery (e.g. SNOWDAS)
 - station-mapped products



Dark blue areas depict the sea. Light blue areas depict the land. Yellow areas depict sea ice. Red areas depict snow.

NCDC and EC snow depth records

- Daily quality-controlled snow depth records are available from the National Climatic Data Center (NCDC).
- 8659 observing stations are within the study area and period.
- Recordings are provided to the nearest inch.
- Environment Canada (EC) produces daily snow depth reports.
- 636 observing stations are within the study area and period.
- Records are provided in centimeters.



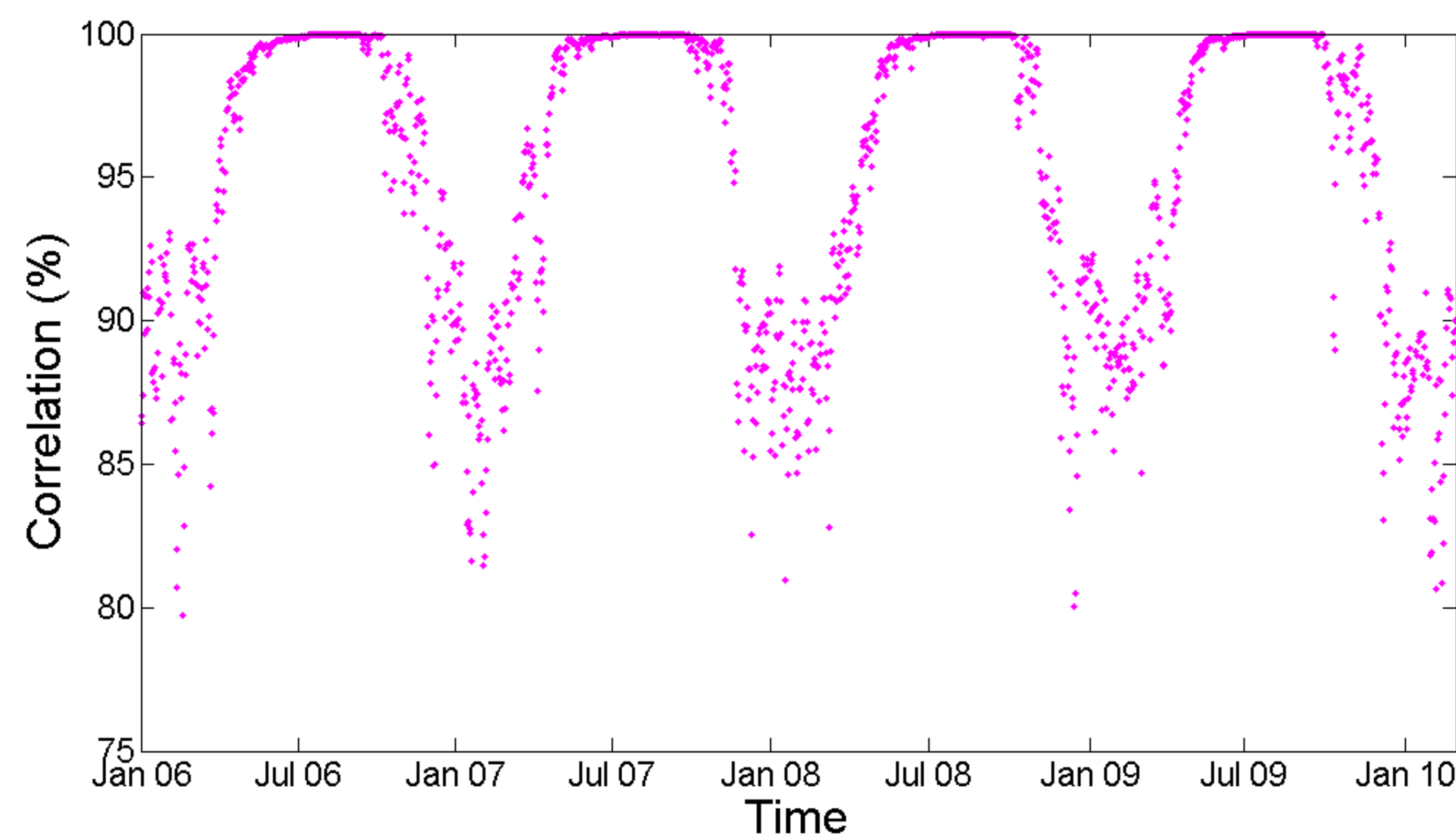
Red dots represent the NCDC stations. Blue dots represent the EC stations.

Data

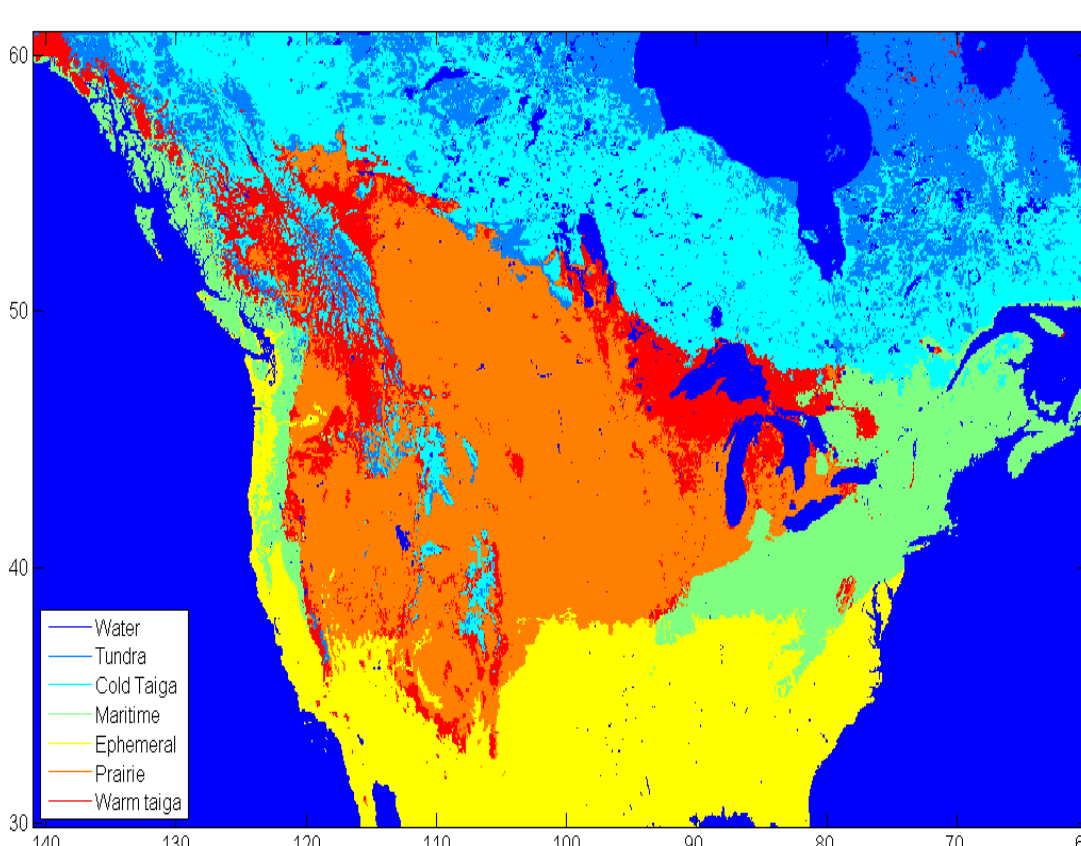
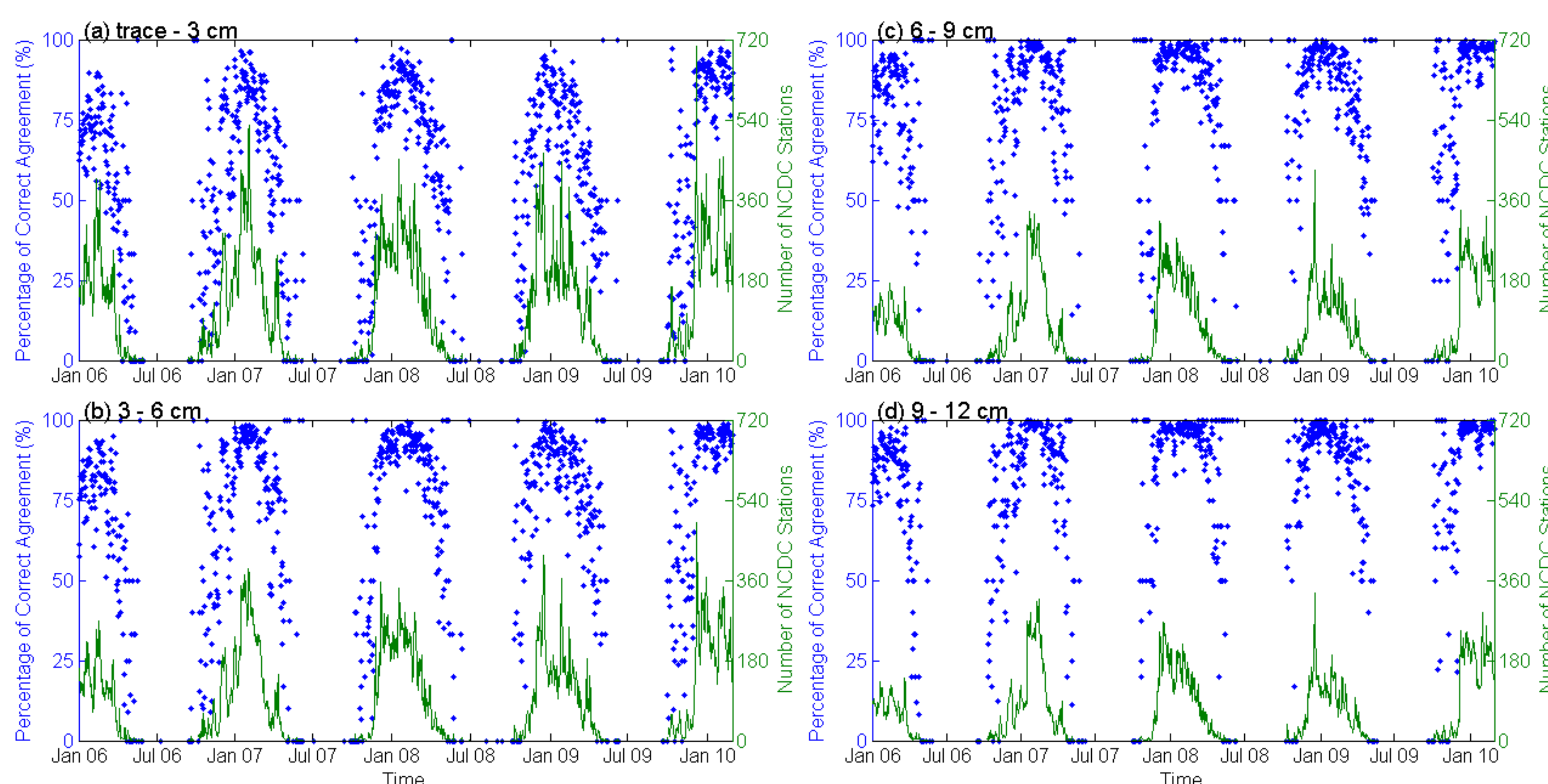
Daily maps of the IMS product and daily snow depth values at NCDC and EC observing stations were obtained from January 2006-February 2010. This allows for coverage over three complete snow seasons.

- The IMS data was obtained for each day in the calendar year. The following days contain missing data: days 185, 186, 187, and 188 of 2006, days 72, 73, 300 and 332 of 2007, day 71 of 2008, and days 69, 70, and 85 of 2009.
- NCDC quality-controlled snow depth data was obtained for each state and day of the calendar year. Observing stations were removed from the study if they were not in the study area and if snow depth data was lacking for the entire study period.

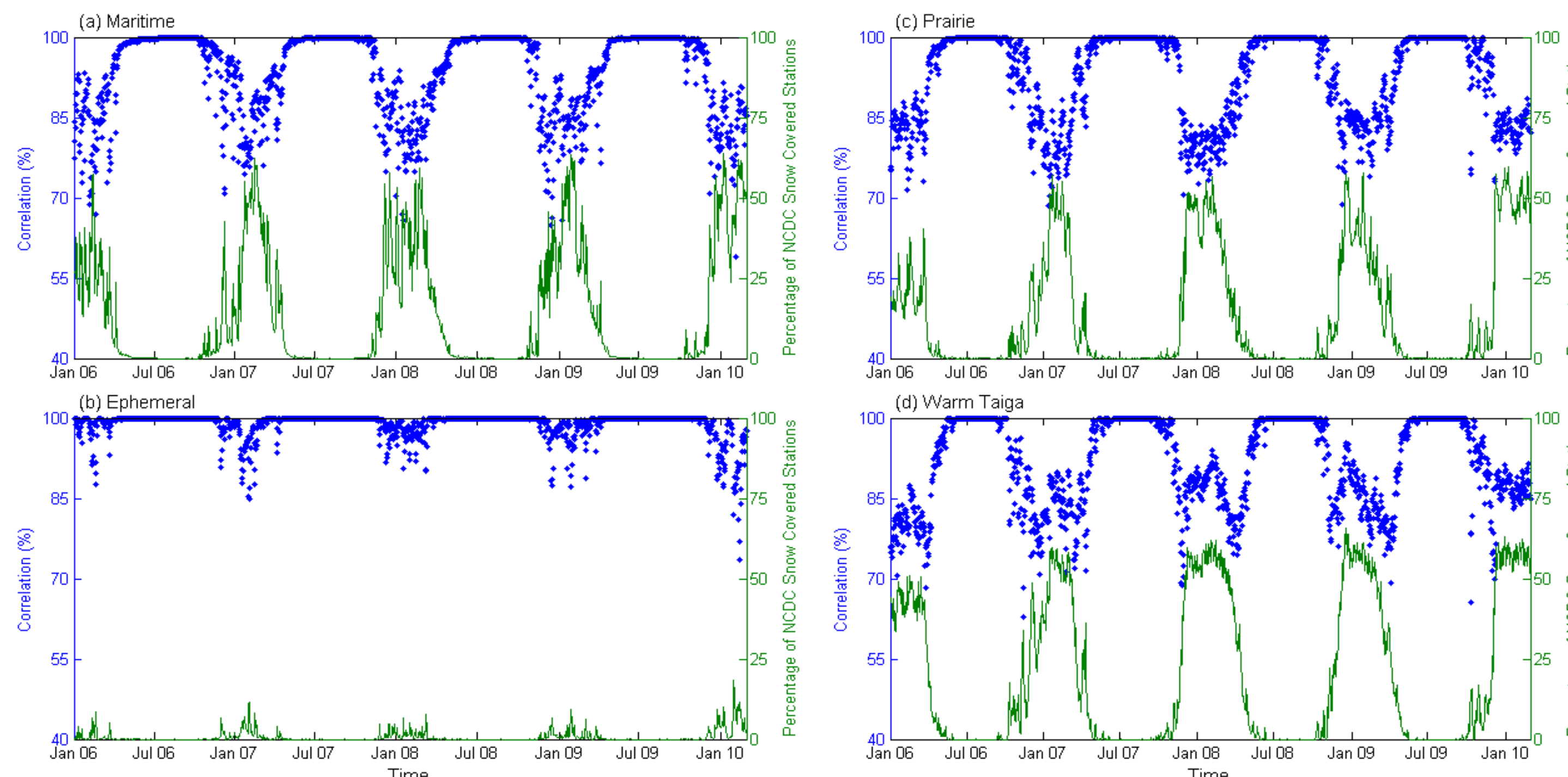
Preliminary Results and Future Work



The correlation between the IMS product snow extent and NCDC snow fall records range from 79.8% - 100%. The percentage of correct agreement between the IMS and observing stations increases with higher recordings of snow depth. Higher correlation between the IMS product and NCDC stations exists in ephemeral snow areas as opposed to maritime, prairie and warm taiga areas.



Snow Class	Total Number of NCDC Stations
Maritime	1341
Ephemeral	3861
Prairie	2795
Warm Taiga	564



Future work: Comparison between the IMS and NCDC observing stations for different land types. Comparisons between the IMS and EC observing stations.

References

1. Sean R. Helfrich, D.M., Bruce H. Ramsay, Thomas Baldwin, and Tim Kasheta, *Enhancements to, and forthcoming developments in the Interactive Multisensor Snow and Ice Mapping System (IMS)*. Hydrological Processes, 2007. 21: p. 1576-1586.
2. Ramsay, B.H., *Prospects for the Interactive Multisensor Snow and Ice Mapping System (IMS)*, in 57th Eastern Snow Conference. 2000: Syracuse, New York, USA.

Acknowledgements

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