Assessment of Precipitation Characters between Ocean and Coast area during Winter Monsoon in Taiwan

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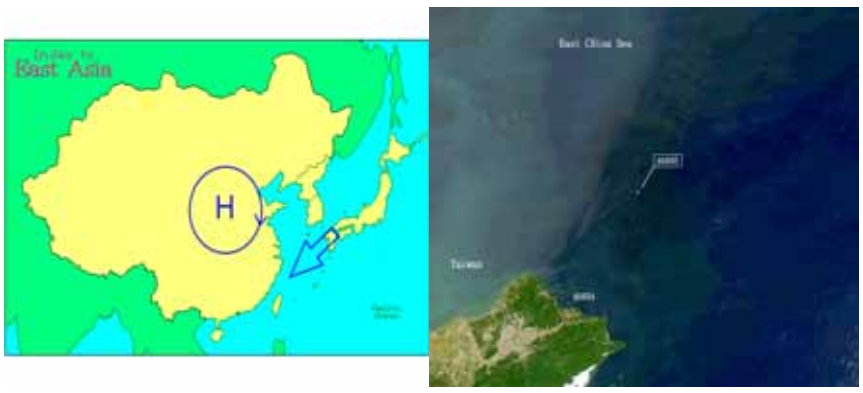
Introduction

Using SSM/I may retrieve precipitation by different ways. Validation over ocean is a tuff task for most of researchers. The comparison of many algorithms was studied (Nazzareno, 2004). For a little long term monitoring from satellite might be useful on climate research.

Data

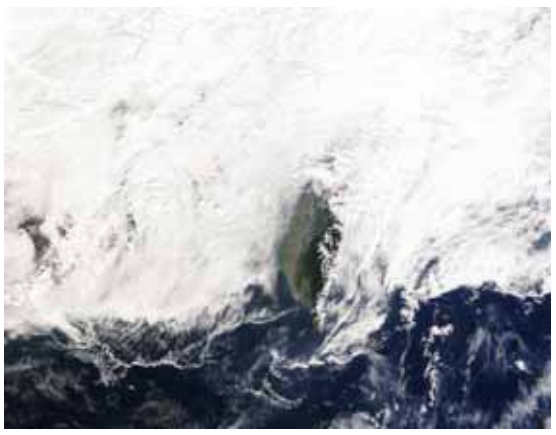
Take surface observation over ocean as ground truth, where is weather station 46695 located on an island in East China Sea north of Taiwan 60Km away. The winter season from Nov. to Mar. is northeast monsoon season and raining in most part of this season. Cloud type is stratus cloud; raining area is more uniform than cumulus cloud type.



Monsoon area covered East Asia in winter season.

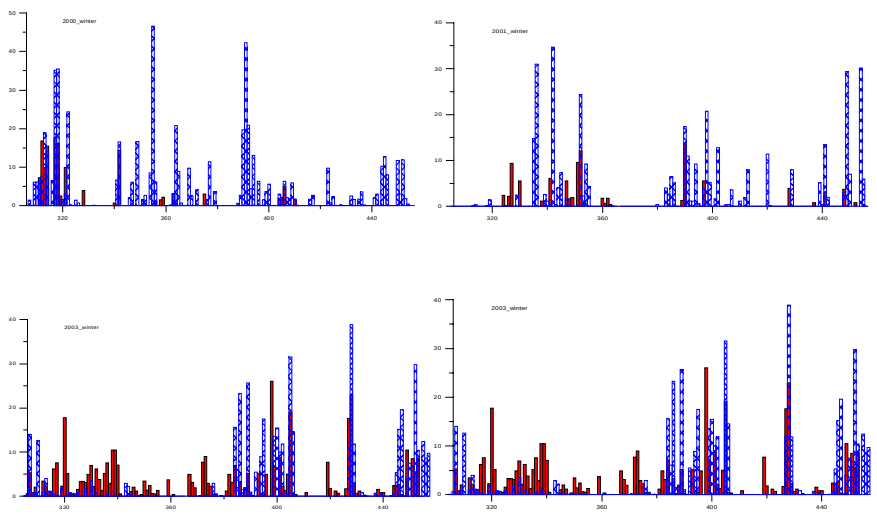
Algorithm

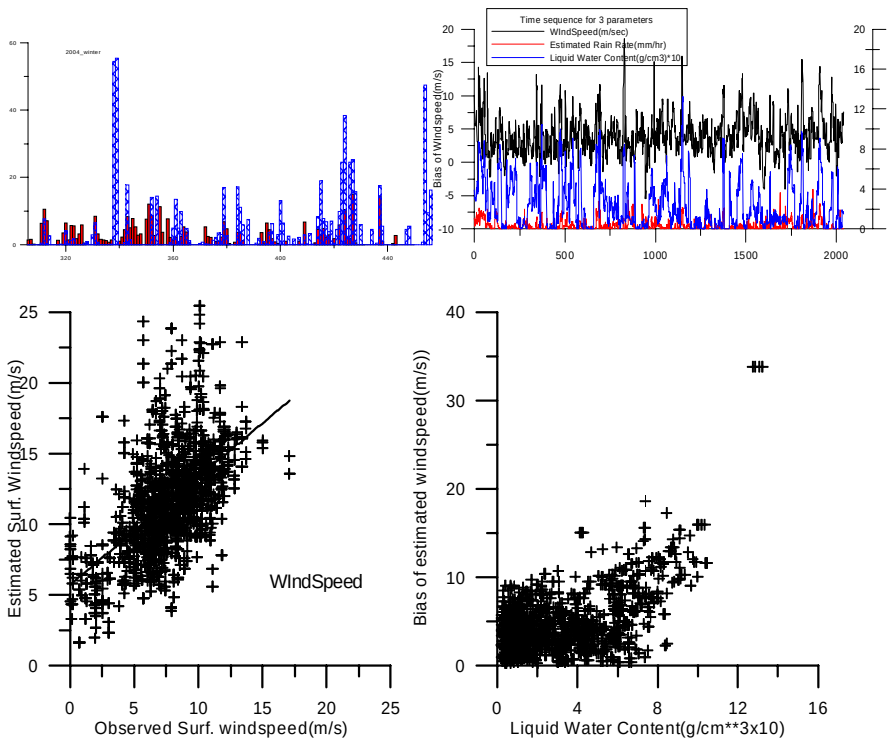
Neural network is used in this research, which include 7 channel observations and 3 Polarized Correct Temperatures (PCT) are applied.



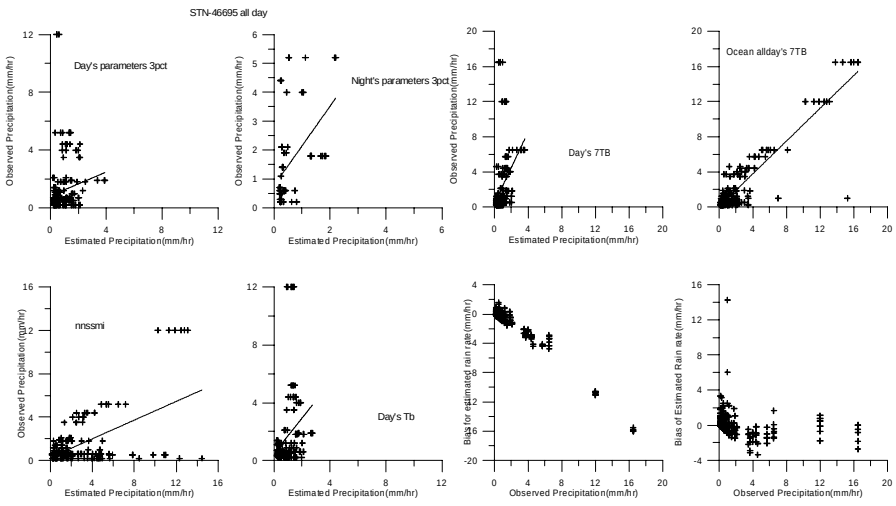
Most of the winter season, in northeast area of Taiwan is covered by cloud and rainfall all day.

Results





Estimated precipitation compare with surface observation in past 5 years, most satellite retrieved rain rate are less than ground truth.



Using a few data sets as input data in Neural Network, the relationship between estimated and observation are shown as

Input data set	Day All	Day 7TB	Day 2PCT	Day PCT85	Day 7TB	Night All
Correlation	0.16	0.255	0.439	0.268	0.367	0.519

Total precipitation (mm) from year 2000-2004

Seasonal	2000	2001	2002	2003	2004
Ground obs.	652.5	432.1	390.5	460.3	670
No of Sat day	20	44	103	106	94
Est. Rainfall	203	234	746	799	661

Conclusion

Trace these 5 year, retrieved precipitation from SSM/I by neural network have a reasonable results, but it cannot identify the extremely precipitation. General speaking retrieval rain rate from satellite is less than ground truth. Because of the satellite path go through one place twice a day, it may miss many rainfall during one day, take the mean value of satellite retrieval rain rate to get a day's precipitation is uncorrected. For at least one third of the satellite do not go through test area, and most surface heavy rainfall do not have SSM/I pass went through, it will cause huge variance on climate study.

The bias of rainfall retrieval in all day's ocean area is the best one. If data set is divided as day and night two parts, the bias is increase. The bias of estimated rain rate is increasing with rain rate, which is less estimated. By the way to retrieve surface wind speed is higher estimated than ground truth about 5 m/sec, and it is increase with wind speed.

There are not so much evidences to prove that local Land Sea wind may introduce more precipitation

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Madison, WI, University of Wisconsin-Madison, Space Science and Engineering Center,
Cooperative Institute for Meteorological Satellite Studies, 2005.