The Development of Upperair Thailand Cumulus Modeling (TCM)
Case study: Upper Northern, Central, Eastern and Northeastern parts of Thailand

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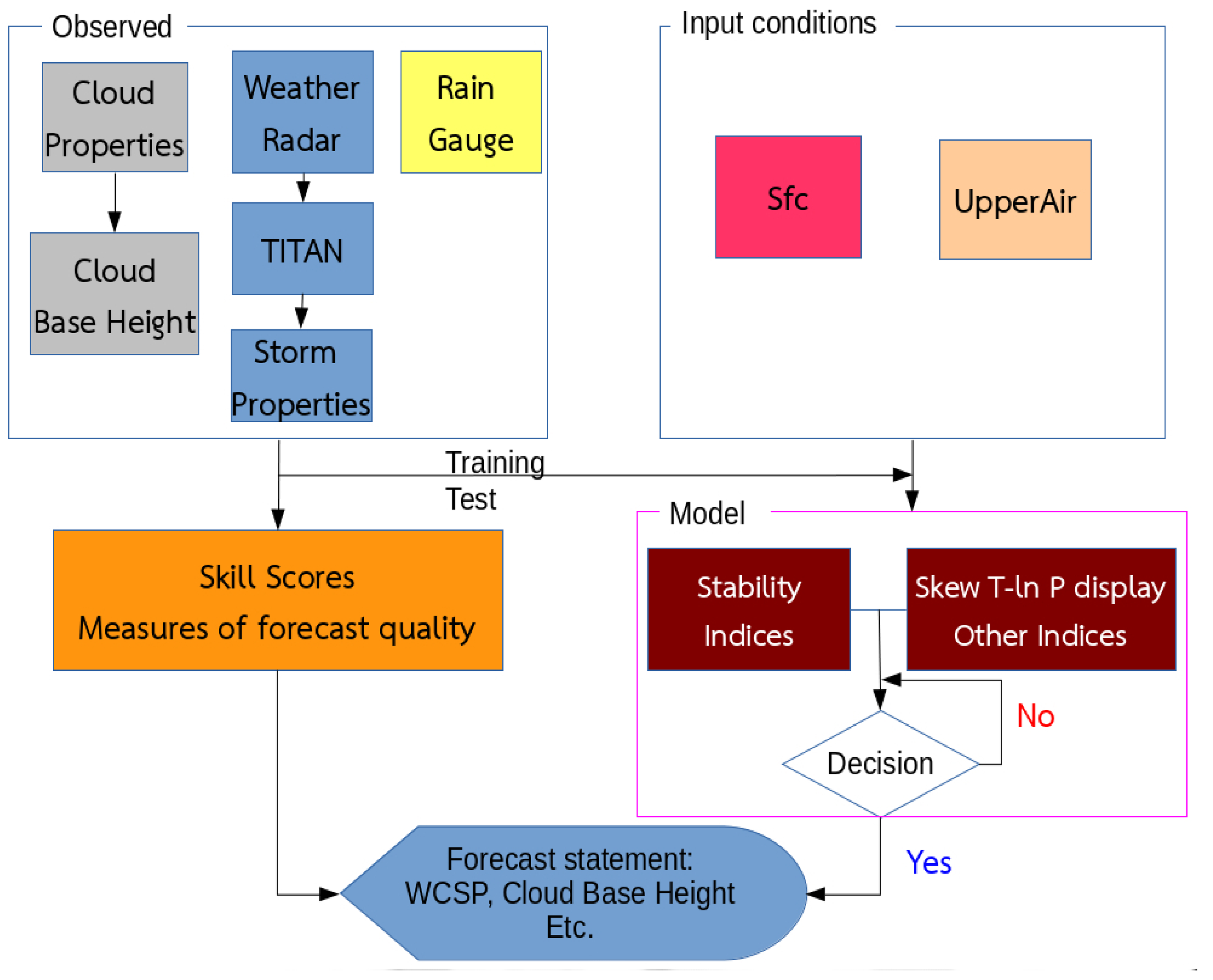
Introduction

Thailand weather modification planning, especially rain enhancement, requires reliable daily weather data of upperair indices which is usually measured every morning at 00 UTC using radiosonde. Data from daily radiosonde have been interpreted and used for warm cloud seeding potential forecasting. However, the overall forecasting and instability indices of current using models are still unreliable and unsuitable for each regions of Thailand, due to the variation of topography and climatic difference. Therefore, the study of upperair indices and new model development have been conducted during year 2012 – 2015, to find regional upperair indices for each part of Thailand and develop the better warm cloud seeding models to support the daily rain enhancement activities.

Methodology

Data from year 2012-2015 are separated into dry (15.Oct – 14.May) and Wet season (15.May – 14.Oct). Upperair data gathering from 4 weather stations of Department of Royal Rainmaking and Agricultural Aviation (DRRAA), had been used as training data to model. Whereas, storm properties derived from DRRAA's 4 weather radar stations and rainfall amount data from rain gauge networks of Thai meteorological department (TMD) and Hydro and Agro Informatics Institute (HAII) installed within each radar measured ranges had been used as observed data for validation (Test data). Correlation coefficient (R) statistics is used for upperair indices selection. The statistical comparison of new and old model had been made using skill score of Heidke and Peirce Skill Score (HSS), Peirce Skill Score (PSS), Gandin-Murphy Skill Score (GMSS) and accuracy.



Conceptual Framework

Radar stations of study Area in Upper northern, central, eastern and northeastern parts of Thailand

Results

Table 1 : Input Regional Parameters for models

Model	Rainy Season	Dry Season
GPCM (Old Model)	8	8
NTCM (Upper North Model)	9	9
CTCM (Central Model)	11	27
ETCM (East Model)	13	44
ITCM (Northeast Model)	8	20

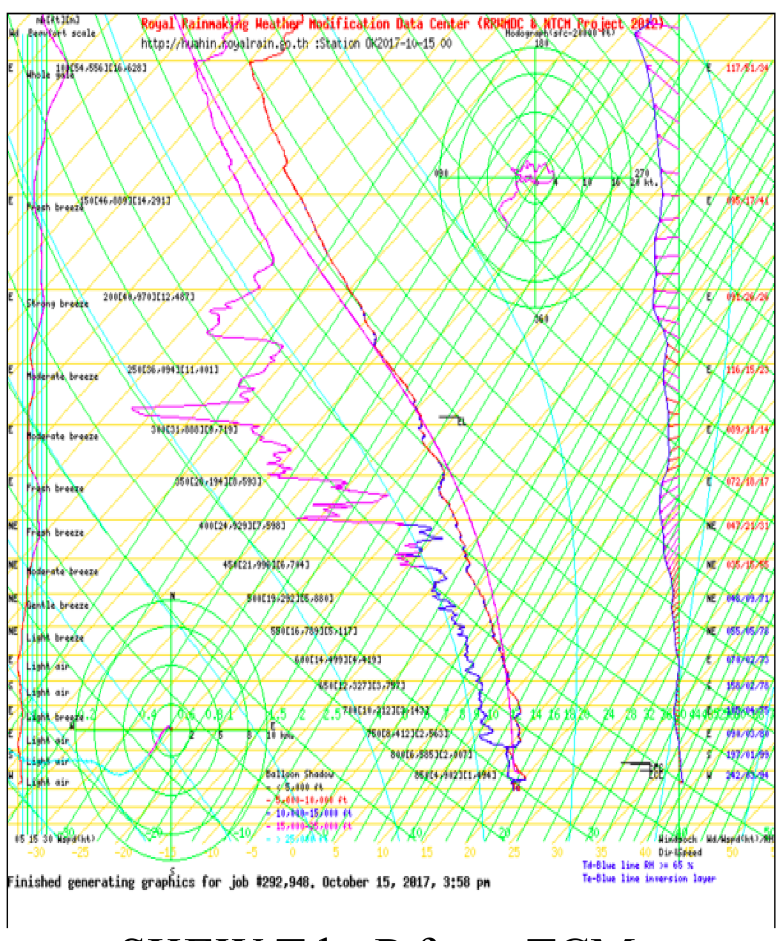
From Table 1, old models have 8 input indices in dry and wet season, upper northern part has 9 input indices in dry season and 9 input indices in wet season, central part has 27 input indices in dry season and 11 input indices in wet season, eastern part has 44 input indices in dry season and 13 input indices in wet season, and north eastern part has 10 input indices in dry season and 7 input indices in wet season. Therefore, the implication upperair indices are difference in each regions and season.

Table 2 :Forecast accuracy of models in percentage

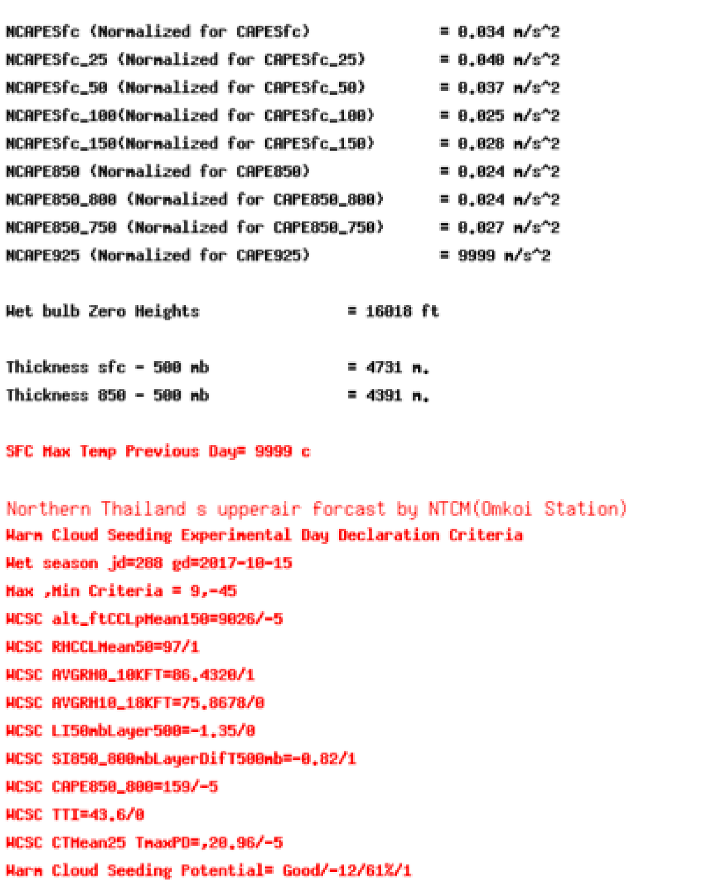
Season	% of Forecast Accuracy							
	NTCM	GPCM	CTCM	GPCM	ETCM	GPCM	ITCM	GPCM
Dry Season (15.Oct – 14.May)	45.5	66.7	53.3	40.0	43.6	20.0	67.70	67.03
Rainy Season (15.May – 14.Oct)	39.1	3.1	49.3	27.0	48.8	32.4	69.08	61.97
Average	42.3	34.9	51.3	33.5	46.2	26.2	68.39	64.50

From Table2 shown that Statistical skill score performance between new and old model found out that the percentage of accuracy and scores for each region of new model are higher than old models for every scores and season.

Conclusions



SKEW T ln-P from TCM



Upperair Indices calculated results and WCSP forecast

The models developed from this study have been shown in DRRAA intranet for daily decision making of operation scientists. The model illustrate in 2 sections one is skew T ln P and second part is indices and WCSP forecasting.

References

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