



Comparison between TAF and MOS focused on wind elements during spring season in 2017-2018

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INTRODUCTION

- In this study, We would like to examine the accuracy of TAF(Terminal Airport Forecast) produced by forecaster at Incheon International Airport and compare the accuracy of TAF with the accuracy of MOS(Model Output Statistics) performed by the KMA(Korea Meteorological Administration) supercomputer.

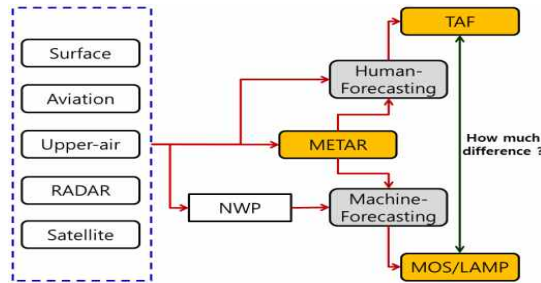


Figure 1. Schematic diagram for operational aviation observing and forecasting system.

SUMMARY

- To compare the accuracy of these, we analyzed wind (speed and direction) data of TAF and MOS in spring season 2017-2018.
- For application to operational aviation-forecasting, we investigated six-hour projection forecasting performance. The result is that TAF's accuracy has still better than MOS in wind speed (10%) and wind direction cases(25%).
- Significant error in wind speed associated with pressure gradient, meanwhile, significant error in wind direction related to passing meso-β scale disturbances.
- In order to solve these problem, meso-scale aviation numerical model should have hourly updated (e.g., HRRR).
- MOS has useful forecasting performance up to 15-hour projection through descriptive statistical parameters such as RMSE, MAE, bias, and correlation.
- AMO can diagnose the possibility of automation of TAF and build the LAMP used the logistic regression method.

REFERENCES

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CASES FOR SIGNIFICANT ERROR

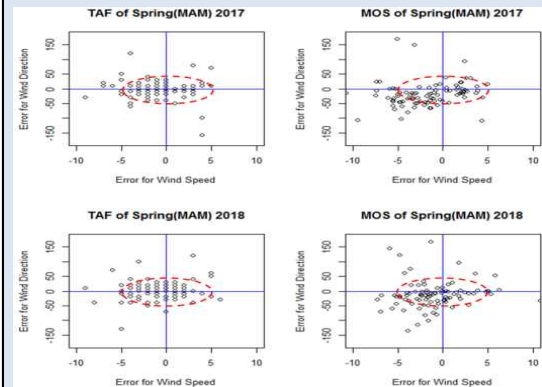


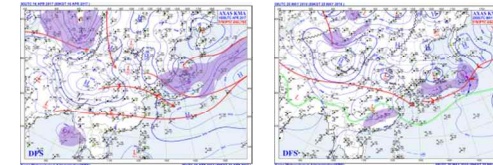
Figure 2. A two-dimensional (wind speed and wind direction) error plotting after +6-hour TAF and MOS forecasts for springtime in 2017-2018.

Table 1. Operationally desirable accuracy of forecasts (ICAO Annex3, 2016)

Element to be forecast	Operationally desirable accuracy of TAF	Minimum % of case within range
Wind direction	± 20 degree	80% of cases
Wind speed	± 2.5 m/s (±5 kt)	80% of cases

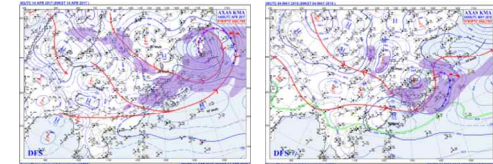
ERROR : TAF-OBS

① 16 APR 2017: ws=+4, wd=-160 / 25 MAY 2018: ws=+0, wd=-70



- [REASON] Combination of upper jet stream and trough to northward from the South Sea

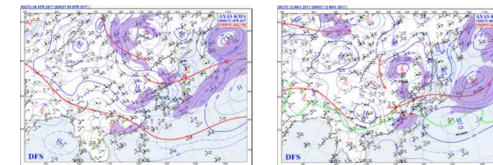
② 14 APR 2017: ws=-9, wd=-30 / 4 MAY 2018: ws=-8, wd=-40



- [REASON] Strong pressure gradient in north-south contrasts after passing trough and approaching upper jet

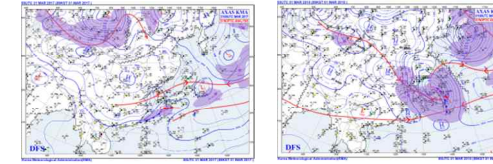
ERROR : MOS-OBS

① 09 APR 2017: ws=+5.1, wd=-170 / 12 MAY 2017: ws=+4.4, wd=-109



- [REASON] Meso scale trough into the West Coast in Korean Peninsula

② 31 MAR 2017: ws=-9.4, wd=-107 / 1 MAR 2018: ws=-15.8, wd=-98



- [REASON] Strong pressure gradient in east-west contracts after passing low pressure system and approaching high pressure system.

Table 2. Comparison between TAF and MOS performances winds for spring in 2017-2018.

Year	Wind speed		Wind direction		U-component		V-component	
	TAF	MOS	TAF	MOS	TAF	MOS	TAF	MOS
2017	95.7	80.4	75.0	41.3	84.8	71.7	83.7	72.8
2018	95.7	84.8	70.7	46.7	89.1	76.1	79.3	71.7

- [As seen in Table 2 and Tale 3]
- A performance of TAF is 20% better than that of MOS.
- A score of wind speed is much better than that of wind direction.
- Error of U (E-W) component is 10% lower than that of V(S-N) component
- For improving accuracy of MOS, we must search for best predictor from the very short-range numerical output.
- However, as longer projection time up to 15-hours projection, as MOS is better performance as seen in Table 3.

Table 3. Bias, RMSE, MAE and correlation coefficient for 11 projection time.

Month	Year	Projection Time										
		+06H	+09H	+12H	+15H	+18H	+21H	+24H	+27H	+30H	+33H	+36H
March	2017	T	T	T	T	T	T	M	M	T	T	T
	2018	M	M	M	M	M	T	M	T	M	M	M
	2019	T	M	M	T	M	T	T	T	T	M	M
April	2017	M	T	M	T	T	T	T	T	M	M	T
	2018	T	T	M	M	T	M	T	M	M	T	T
	2019	T	M	M	M	T	M	T	M	M	M	M
May	2017	T	T	M	M	M	M	T	T	T	T	T
	2018	T	T	M	M	T	T	T	T	T	T	T
	2019	T	T	M	M	T	T	T	T	T	T	T

ACKNOWLEDGEMENTS

This study has been supported under the General Research and Development Expenditure for Aviation Meteorological Office of Korea Meteorological Administration in 2018.