WGNE Intercomparison of Tropical Cyclone Track Forecasts from Operational Global Models and Regional Models

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1. Introduction

Since 1991, the CAS/JSC Working Group on Numerical Experimentation (WGNE) has conducted intercomparison of tropical cyclone track forecasts using operational global models. This time is the 20th aniversary. In 2010, the project involved eleven such models, and verification of six regional models was also conducted for the first time.

2. Datasets and verification method

Table 1 shows the specification of global models datasets provided by participating NWP centers, and Table 2 shows the corresponding information for regional models.

The verification area is divided into six regions according to the domains of responsibility for each TC RSMC. Best-track data provided by each RSMC is used in the verification. The verification method of Sakai and Yamaguchi (2005) was adopted in this study.

Table 1 Global model specifications

NWP centers	Participate Year	Bogus data	Model Res. as of 2010
BoM	2003	-	80kmL50
CMA	2004	used	T_L639L60
CMC	1994	-	0.45° x0.3° L58
DWD	2000	-	40kmL40(- Feb.) 30kmL40(Feb.-)
ECMWF	1991	-	T_L799L91(-Jan.) T_L1279L91(Jan.-)
JMA	1991	used in WNP	T_L959L60
KMA	2010	used	T426L40(-May.) 40kmL50（May.-）
France	2004	usedexcept for South Pacific and north Indian-Ocean	T538C2.4L70(-Apr.) T_L798C2.4L70(Apr.-)
NCEP	2003	used in rare case	T382L64(-Jul.) T574 L64 (Jul.-)
NRL	2006	used	T239L30
UKMO	1991	used	40kmL70(-Mar.) 25kmL70(Mar.-)

Table 2 Regional model specifications

NWP centers	Name of Model	Verification Region	Bogus data	Model Res. as of 2010
JMA	MSM	WNP	Used	5kmL50
KMA	Unified Model	WNP (north to 20N west to 140E)	Used	12kmL38
France	Aladin-Reunion	SIO (31E-88.5E 32S-0)	Used	8kmL70
NCEP	HWRF	NAT,ENP	Used	inner 9km outer 27km L42
	GFDL	NAT,ENP	Used	1/12 degree(third nest) L42
UKMO	South Asia Regional Model	NIO	Not Used	12kmL70

3. Global model verification

Figure 1 shows the position error growth for the global models over the western North Pacific and North Atlantic regions. The error of the ECMWF forecast is very small during the verification period over the western North Pacific. On the whole, the error growth for the North Atlantic is smaller than that for the western North Pacific. Figure 2 shows the position error of operational models in these 20 years. It can be seen that tropical cyclone track forecasting has gradually improved at all operational centers along with the enhancements to their NWP systems.

4. Regional model verification

Figure 3 shows the position error growth for regional models, with thick lines indicating the errors for each one. It can be seen that most are better at forecasting TC tracks than the global models of their respective countries.

References

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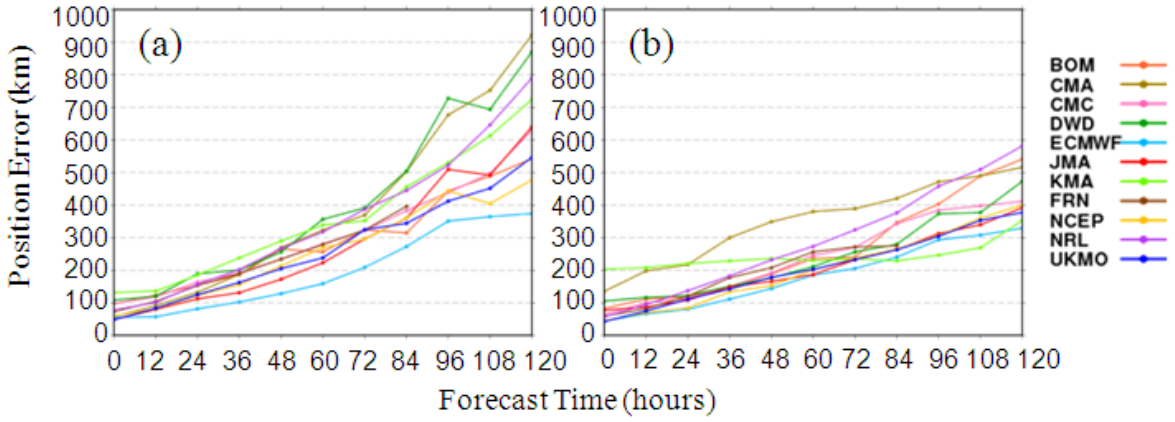

Fig.1 Position error growth in (a) the western North Pacific, and (b) the North Atlantic

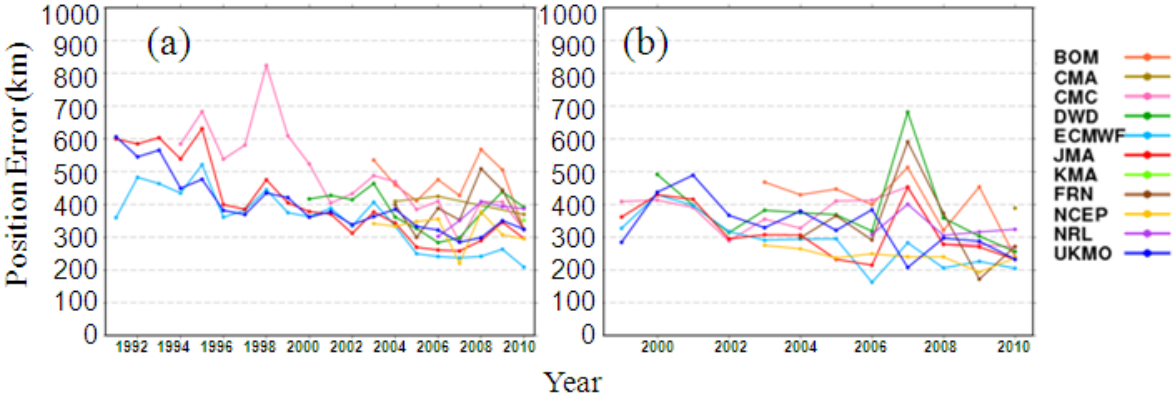

Fig.2 Transition of 72-hour forecast position errors over (a) these 20-year period starting in 1991 for the western North Pacific, and (b) these 12-year period starting in 1999 for the North Atlantic

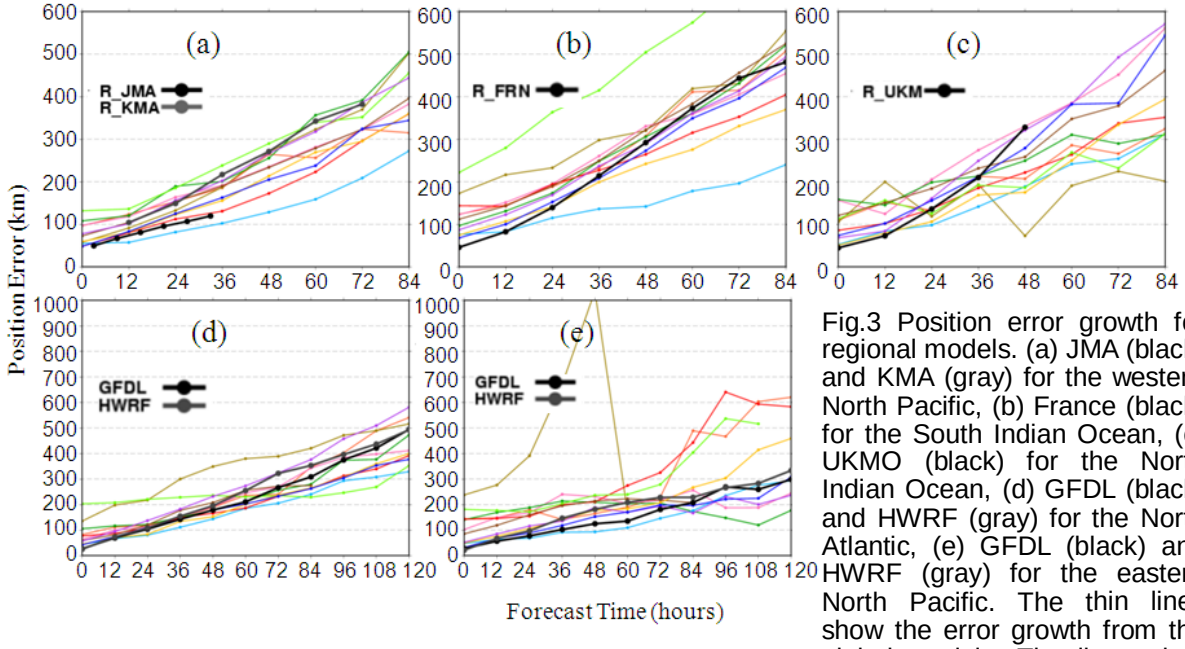

Fig.3 Position error growth for regional models. (a) JMA (black) and KMA (gray) for the western North Pacific, (b) France (black) for the South Indian Ocean, (c) UKMO (black) for the North Indian Ocean, (d) GFDL (black) and HWRF (gray) for the North Atlantic, (e) GFDL (black) and HWRF (gray) for the eastern North Pacific. The thin lines show the error growth from the global models. The line colors are the same as those for Figs. 1 and 2.