## Seasonal Tropical Cyclone Forecast – Part 2

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## Forecasting monthly and seasonal TC activity

- The statisticaly-dynamical method can be easily adapted to produce forecasts for other cities.
- Requirement:
  - TC climatology
  - Dynamical climate model forecast (e.g. NCEP, JMA, ...)
- Two examples: Manila & Danang
  - TC climatology based on HKO TC best track data
  - Dynamical climate model: NCEP CFS

NCEP – http://cfs.ncep.noaa.gov/

JMA - http://ds.data.jma.go.jp/tcc/tcc/index.html



## Example 1: Manila



## Average Monthly N500 of Manila



## Example 1: Manila



### Manila: Jul N500 climatological distribution (1971-2000)



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## Manila: Jul N500 time series, 1981-2008

#### Manila: Jul N500, 1981-2008



#### Manila Jul N500 time series: hindcast & actual



### Manila: Oct N500 climatological distribution (1971-2000)



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## Manila: Oct N500 time series, 1981-2008

#### Manila Oct N500, 1981-2008



#### Manila Oct N500 time series: hindcast & actual



# Manila: JJA N500 climatological distribution (1971-2000)



## Manila: JJA N500 time series, 1981-2008

#### Manila JJA N500



#### Manila JJA N500 time series: hindcast & actual



# Manila: SON N500 climatological distribution (1971-2000)



## Manila: SON N500 time series, 1981-2008



#### Manila SON N500 time series: hindcast & actual



Performance comparison: No. of correct N500 forecast for Manila verification period: 1981-2008

	1971-2000 Climatology (mode)	Top GLM (% gain in bracket)	Multi-GLM (% gain in bracket)
Jul	11	21 (91%)	26 (136%)
Oct	11	21 (91%)	26 (136%)
JJA	10	19 (90%)	25 (150%)
SON	8	17 (113%)	23 (188%)



## Example 2: Da Nang



## Average Monthly N500 of Da Nang



## Example 2: Da Nang



#### Da Nang Sep N500 climatological distribution (1971-2000)



## Da Nang Sep N500 time series, 1981-2008



## Da Nang Sep N500 time series, 1981-2008



#### Da Nang Oct N500 climatological distribution (1971-2000)



## Da Nang Oct N500 time series, 1981-2008



## Da Nang Oct N500 time series, 1981-2008



## Da Nang: JJA N500 climatological distribution (1971-2000)



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### Da Nang: JJA N500 time series, 1981-2008



#### Da Nang: JJA N500 time series, hindcast & actual



## Da Nang: SON N500 climatological distribution (1971-2000)



## Da Nang: SON N500 time series, 1981-2008



#### Da Nang: SON N500 time series, hindcast & actual



### Performance comparison: No. of correct N500 forecast for Da Nang verification period: 1981-2008

	1971-2000 Climatology (mode)	Top GLM (% gain in bracket)	Multi-GLM (% gain in bracket)
Sep	13	24 (85%)	28 (115%)
Oct	8	20 (150%)	26 (225%)
JJA	10	21 (110%)	25 (150%)
SON	8	16 (100%)	25 (213%)

#### Remarks

- There may be positive skill bias in the verification results.
- Need to cross-validate the whole process.
- Operational consideration: Also apply the method to other dynamical climate modes, e.g. JMA, if possible
- Some real life examples from Hong Kong:



### Example: Use more than 1 climate model Forecast for HK for July 2010

1. Use top 20 GLM



#### Example: Forecast for HK for July 2010

- 1. Use top 20 GLM
- 2. Use NCEP and JMA models





#### Example: Forecast for HK for July 2010

Actual: 1 TC (Chanthu) within 500 km of HK



#### Example: Use more than 1 climate model Forecast for HK for September 2010



#### Example: Forecast for HK for September 2010



#### Example: Forecast for HK for September 2010

Actual: 2 TCs within 500 km of HK



## Example: Forecast for Aug & Oct 2010

 The forecast for Aug 2010 was wrong, probably because unequal weights were given to NCEP and JMA.



#### Remarks

- The above examples are drawn from very limited HKO experience
- Better to consider the floating point forecast given by the GLM and the associated probability distribution
- Can pool the distributions given by multiple GLM of multiple dynamical model together to construction a forecast probability distribution



## Thank you

