

Challenges and Limitations of Typhoon Forecast

A decorative graphic on the right side of the slide. It features a series of overlapping, wavy blue lines that create a sense of motion and depth. Scattered throughout this graphic are numerous circles of varying sizes and colors, including light blue, dark blue, and white with black outlines. The overall effect is a modern, dynamic background element.

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Outline for typhoon track forecast

- Optimized ensemble mean.

SUMMER

(SUper Multi-Model Ensemble Realignment for typhoon forecast)

- The possibility improvement of ensemble based track forecast.
- How many ensemble members do we need?



Ensemble Dataset

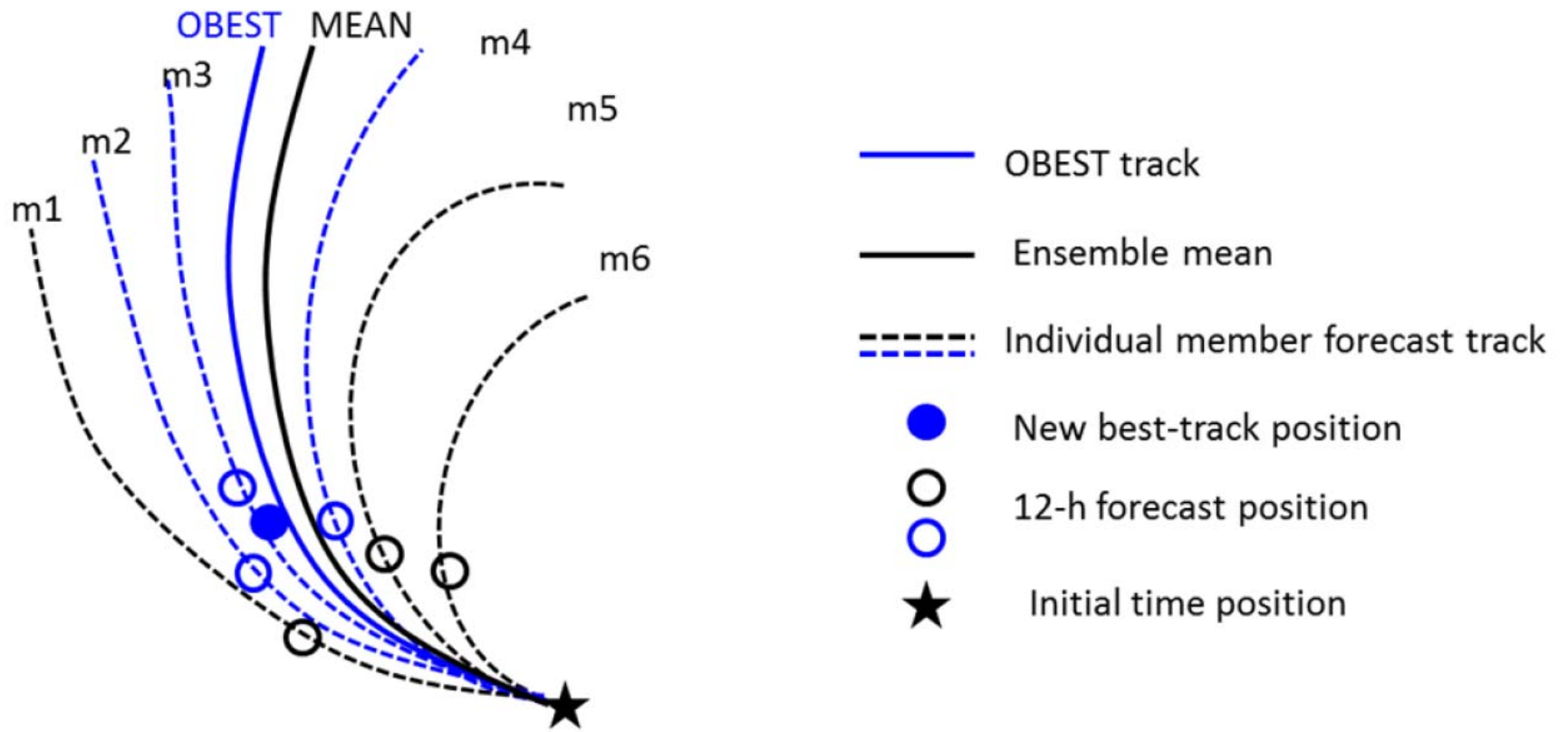
	Global Model	
	ECMWF	NCEP
Daily Fcst	2 (00, 12 UTC)	4 (00, 06, 12, 18 UTC)
Member	51	21
Resolution		
Levels/ Model Top		
Ensemble Design Strategy	4DVAR	ET (Ensemble Transform)



Optimized Ensemble Mean

OBEST

(Observation-Based Ensemble Subsetting Technique)



Dong and Zhang (2016)

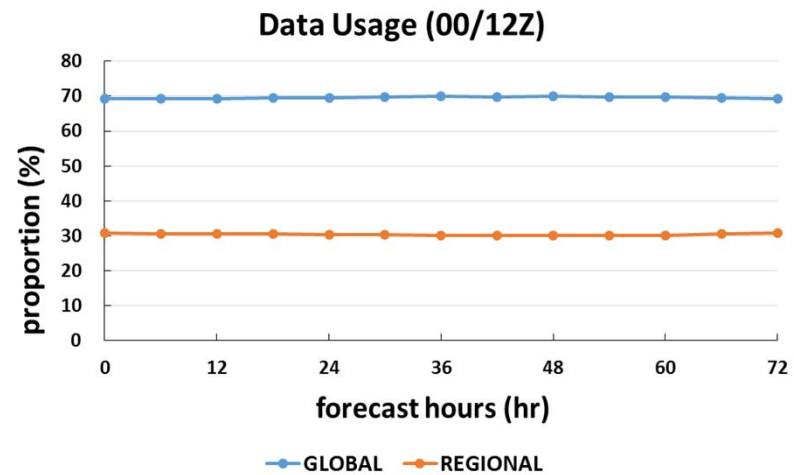
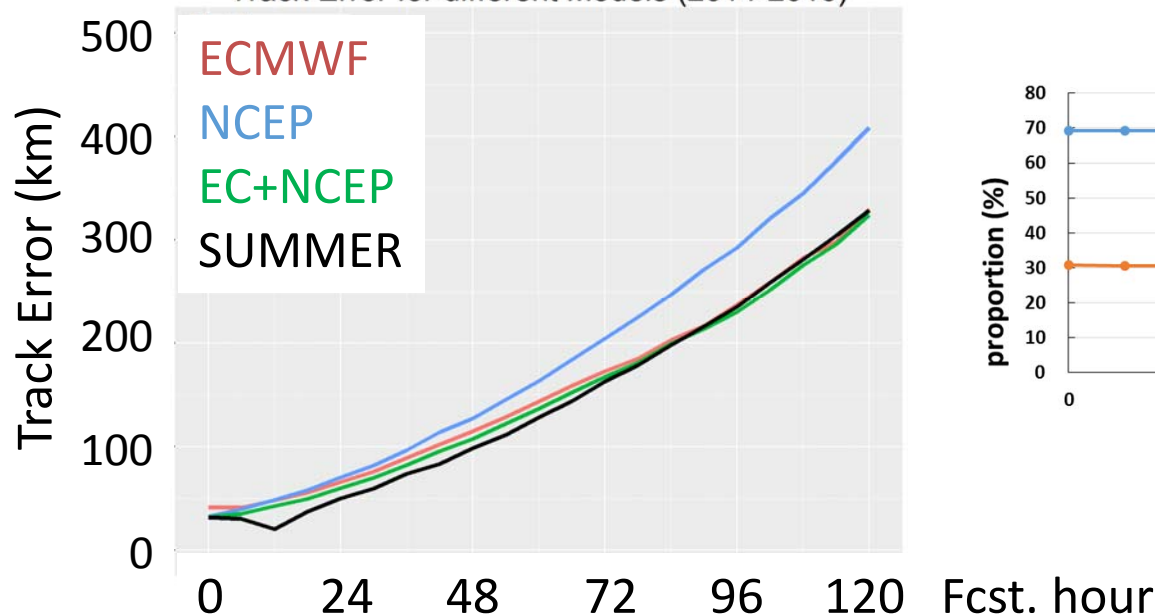
Weighted Ensemble Mean

SUMMER

(SUPER Multi-Model Ensemble Realignment for typhoon forecast)

- Based on ~~JMA best track~~ → CWB working track
- Using ~~only global model ensemble system~~
→ Global+ Regional ensemble system (TAPEX&CWB EPS)
Total 115 members select 29 member
- Only on 00/12 Z → Adding 06/18 Z strategy

Track Error for different Models (2014-2016)

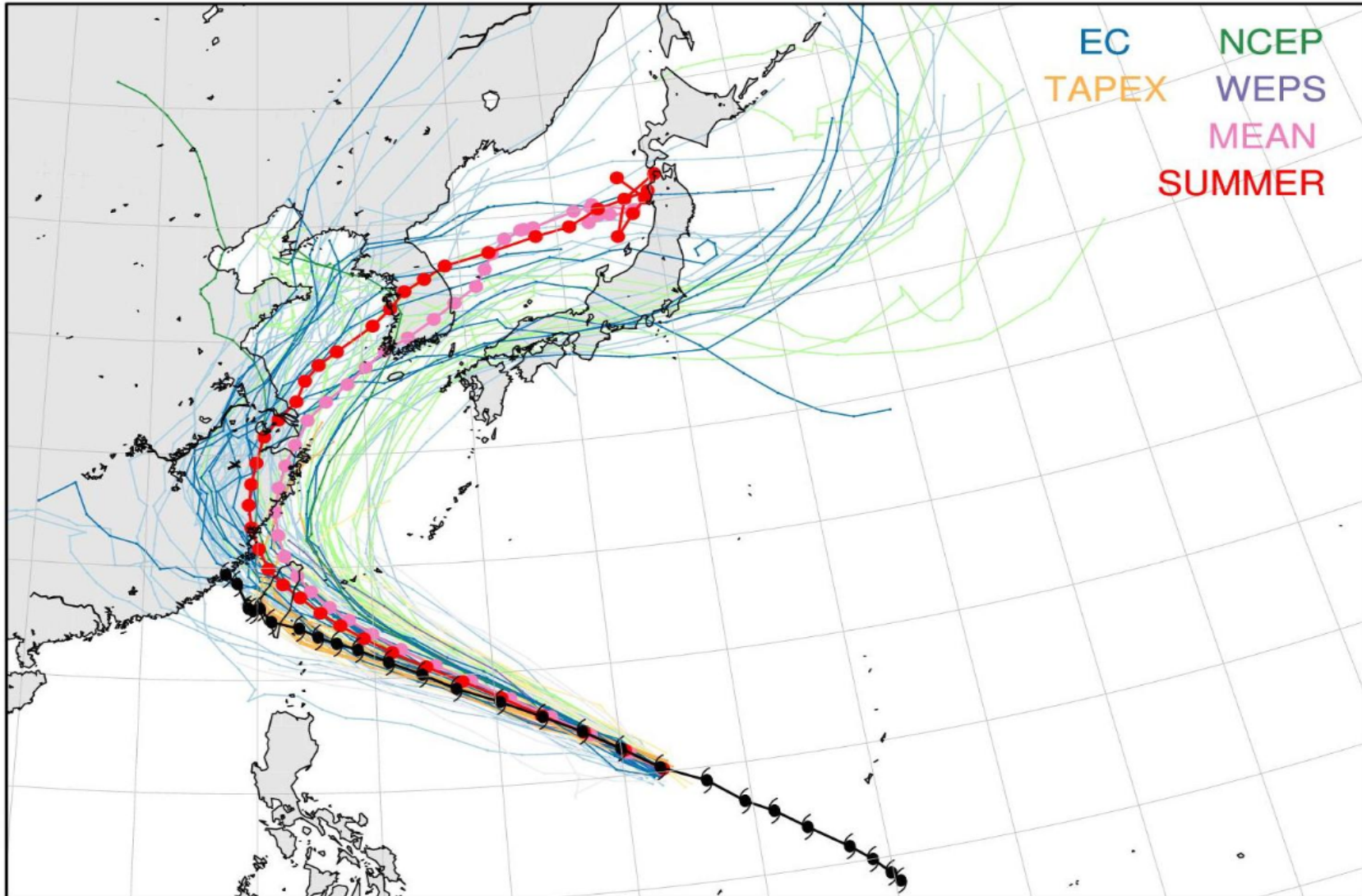


Hsiao et al. (2017)



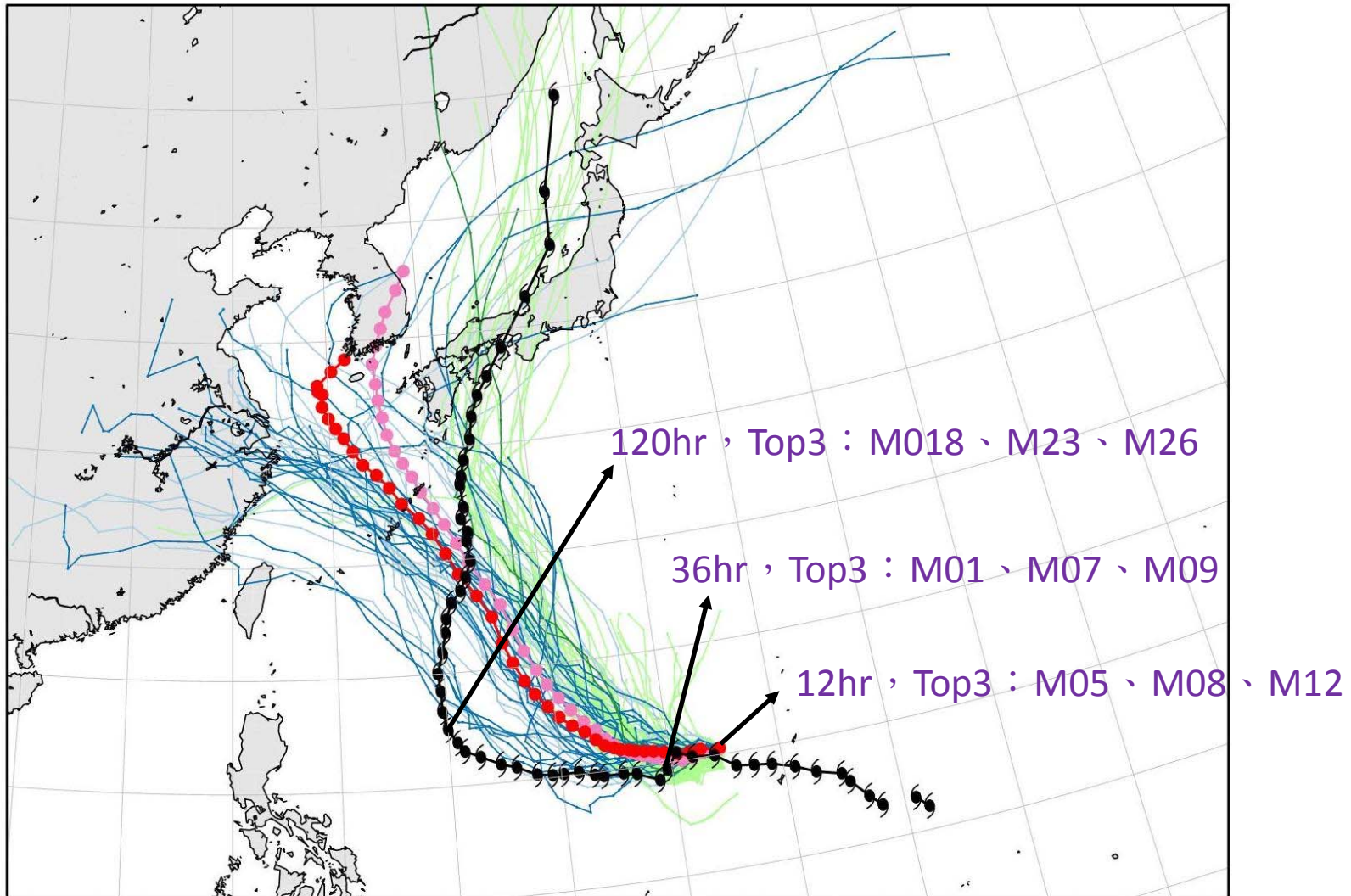
SUMMER

2016NEPARTAK : 2016070500 (m)



TopN Analysis

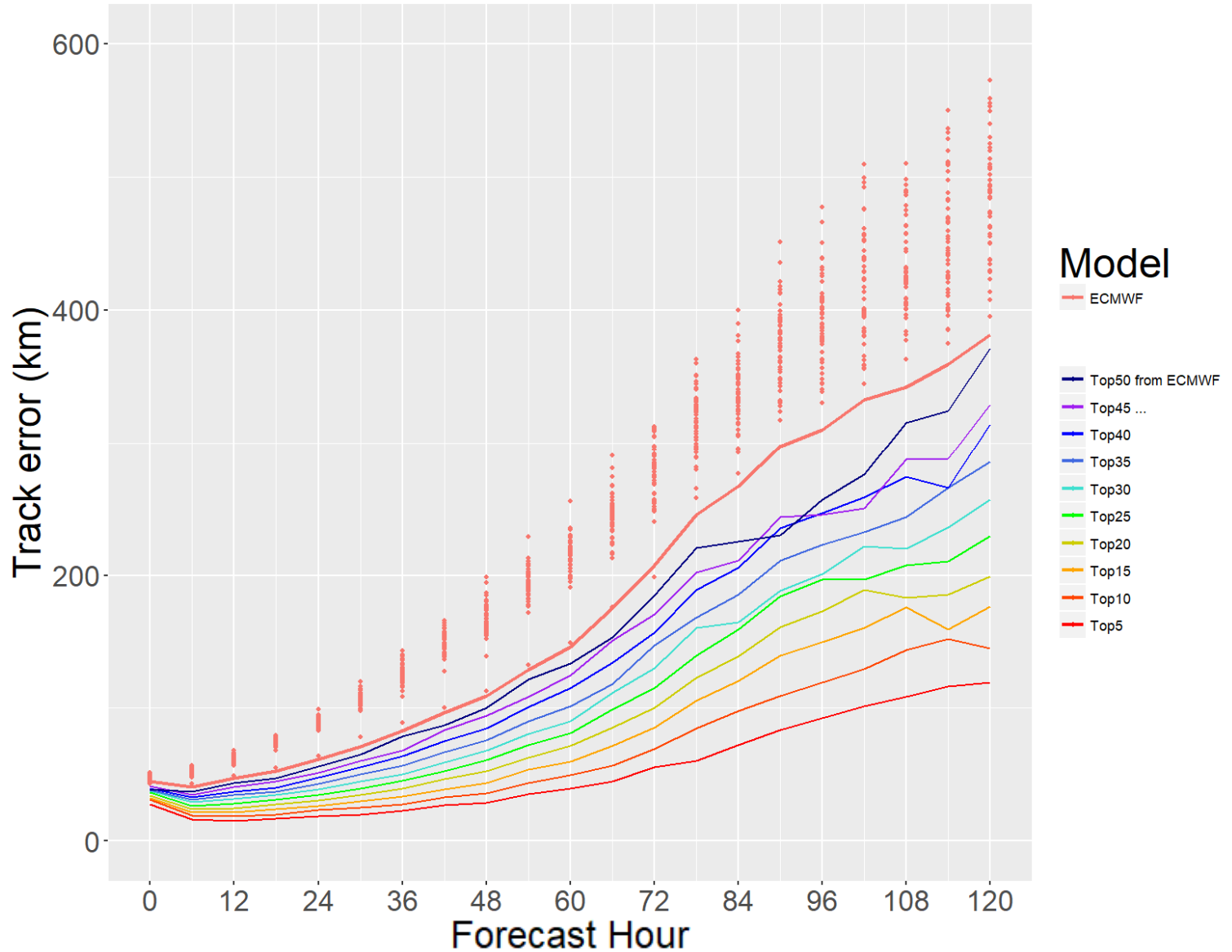
2014HALONG : 2014073100 (M28) (m)





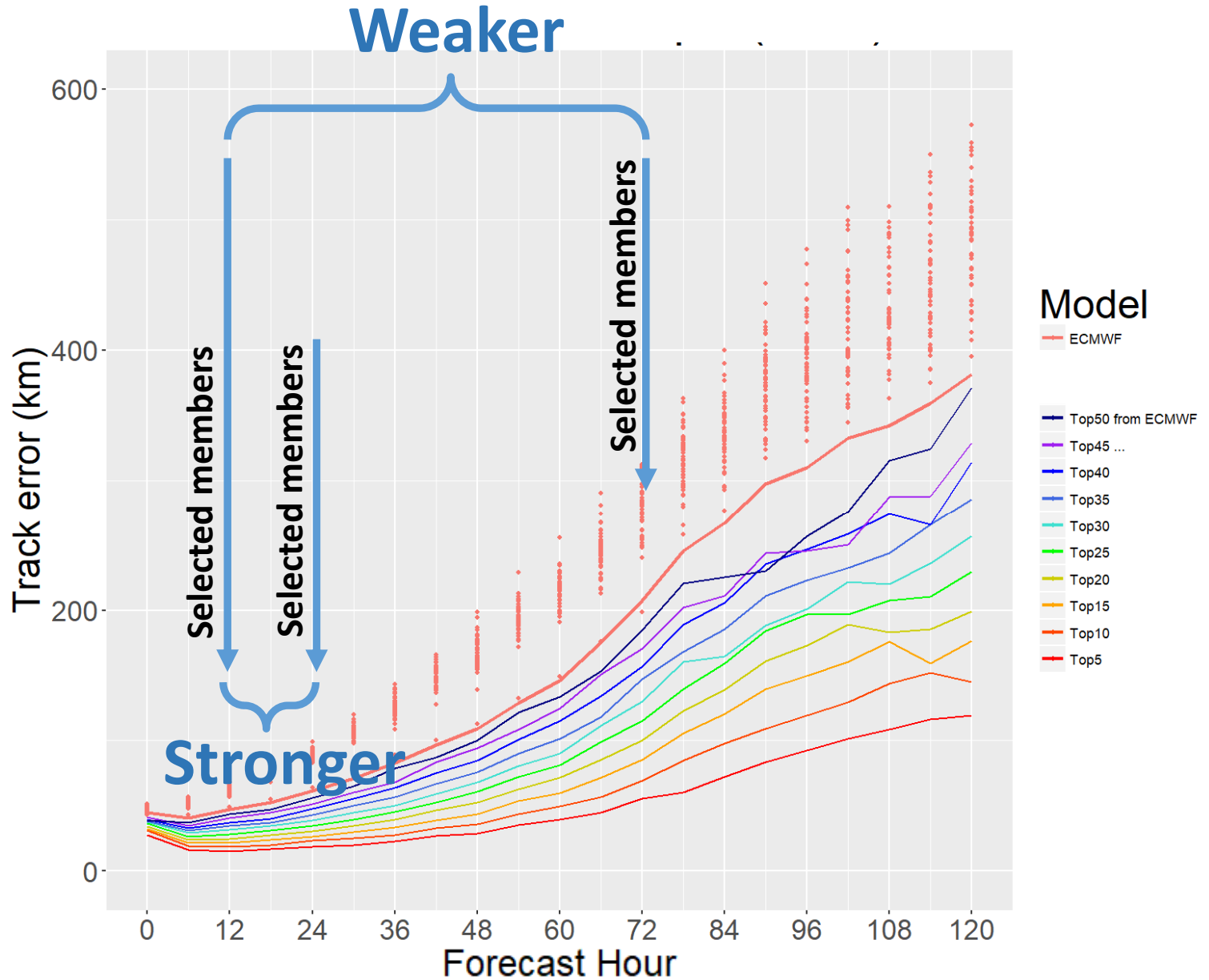
TopN Analysis – ECMWF

Track Error for different TopN (2017)





TopN Analysis - ECMWF





How to decide the ensemble member

If we have 5 members: M01, M02, M03, M04, M05

$C^5_1 \Rightarrow (M01), (M02), (M03), (M04), (M05) \Rightarrow 5$ results

$C^5_2 \Rightarrow (M01,M02), (M01,M03), (M01,M04), (M01,M05)$
 $(M02,M03), (M02,M04), (M02,M05), (M03,M04)$
 $(M03,M05), (M04,M05) \Rightarrow 10$ results

$C^5_3 \Rightarrow \dots \dots \dots \Rightarrow 10$ results

$C^5_4 \Rightarrow \dots \dots \dots \Rightarrow 5$ results

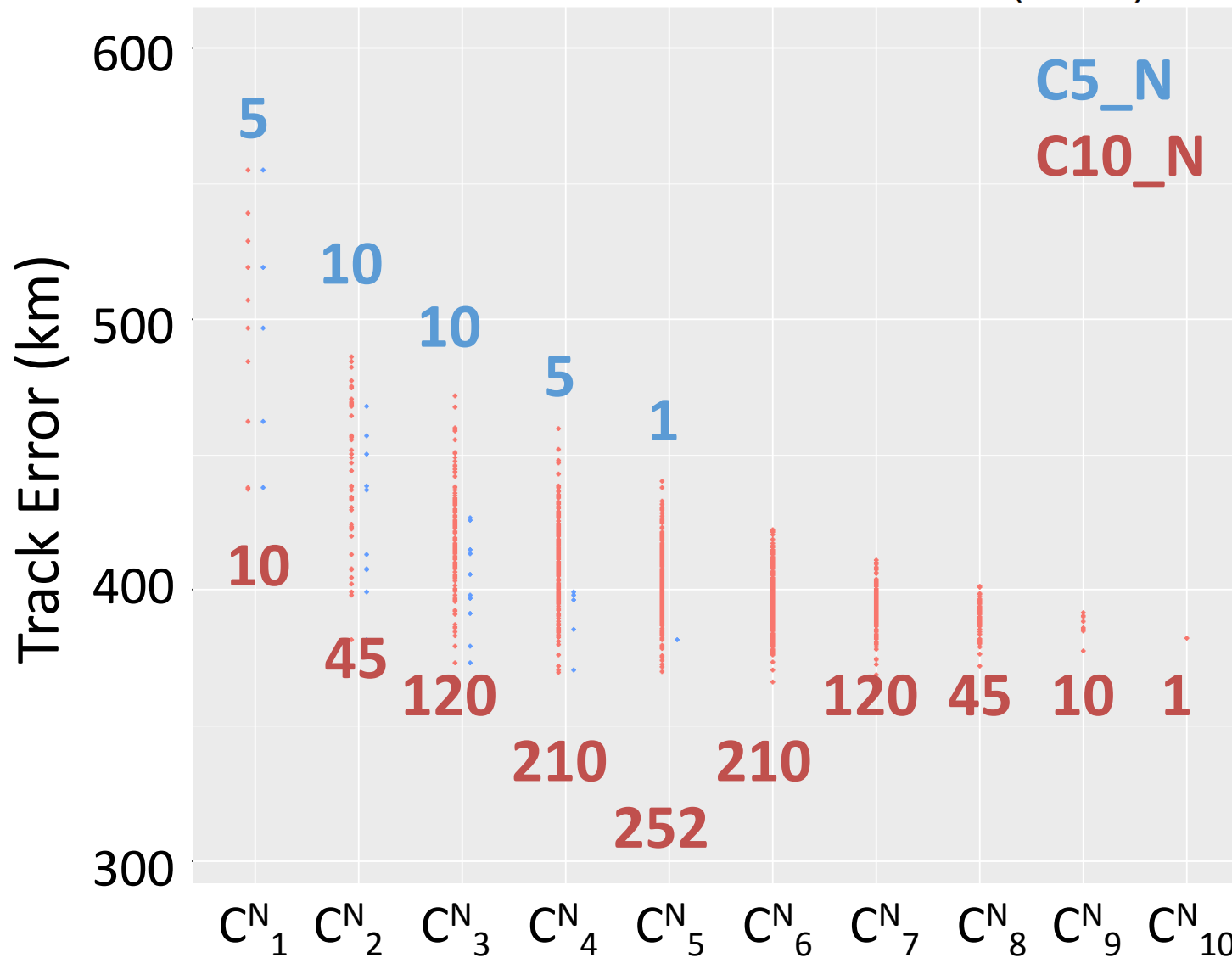
$C^5_5 \Rightarrow (M01, M02, M03, M04, M05) \Rightarrow 1$ results **Ensemble mean**



Combination for ECMWF – C5,C10

Fcst 120h

Track Error for different Combination (2017)

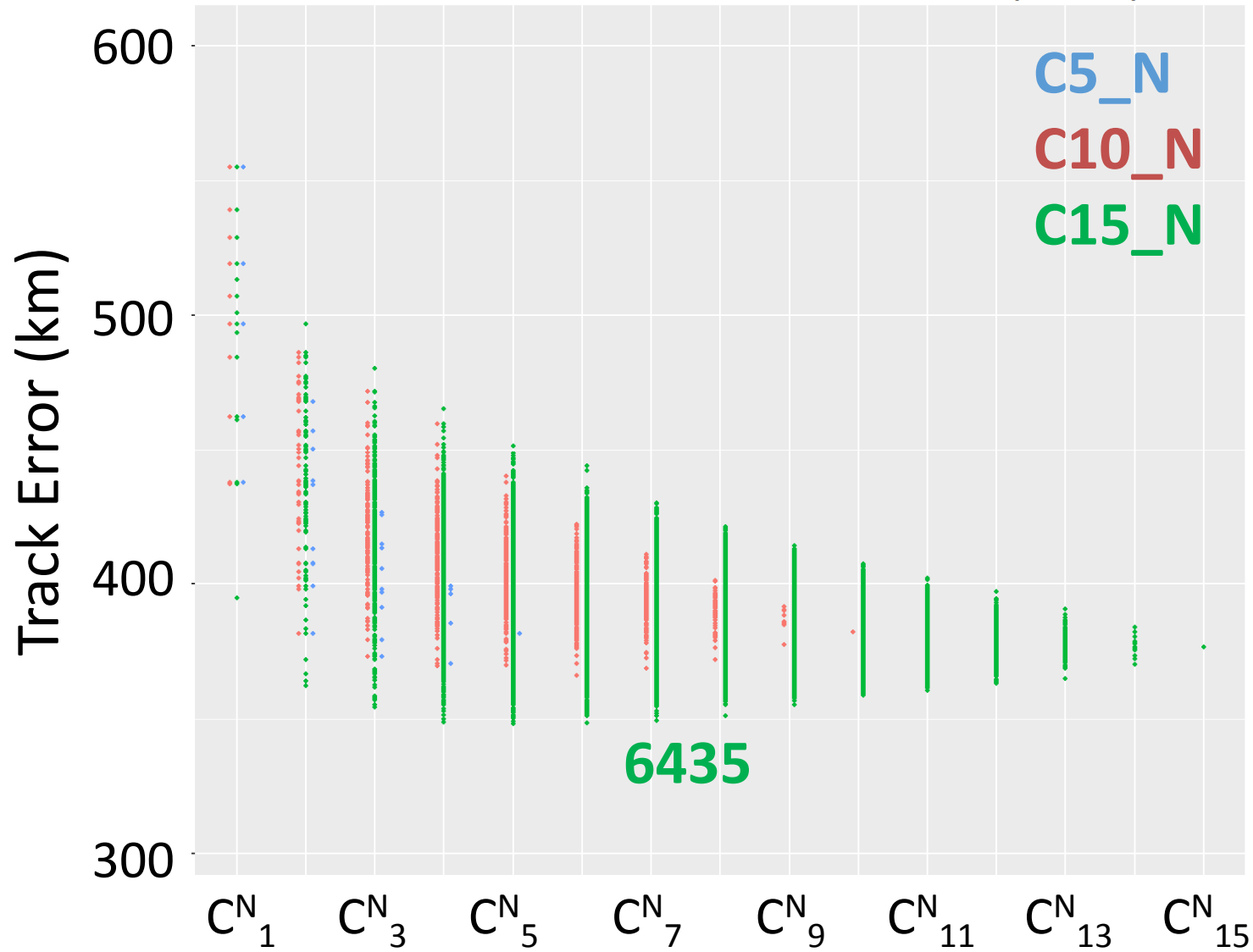




Combination for ECMWF – C5,C10,C15

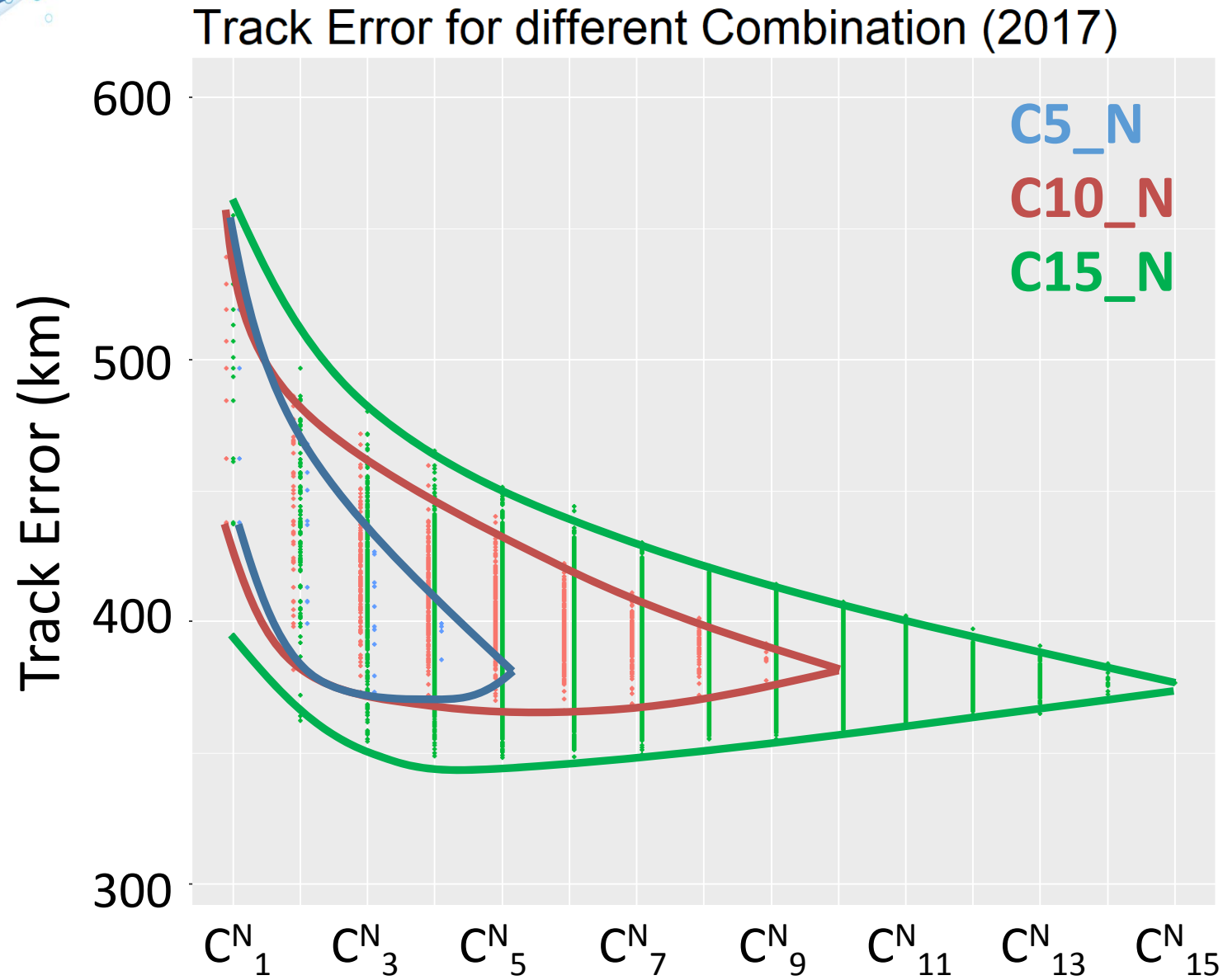
Fcst 120h

Track Error for different Combination (2017)



Combination for ECMWF – C5,C10,C15

Fcst 120h

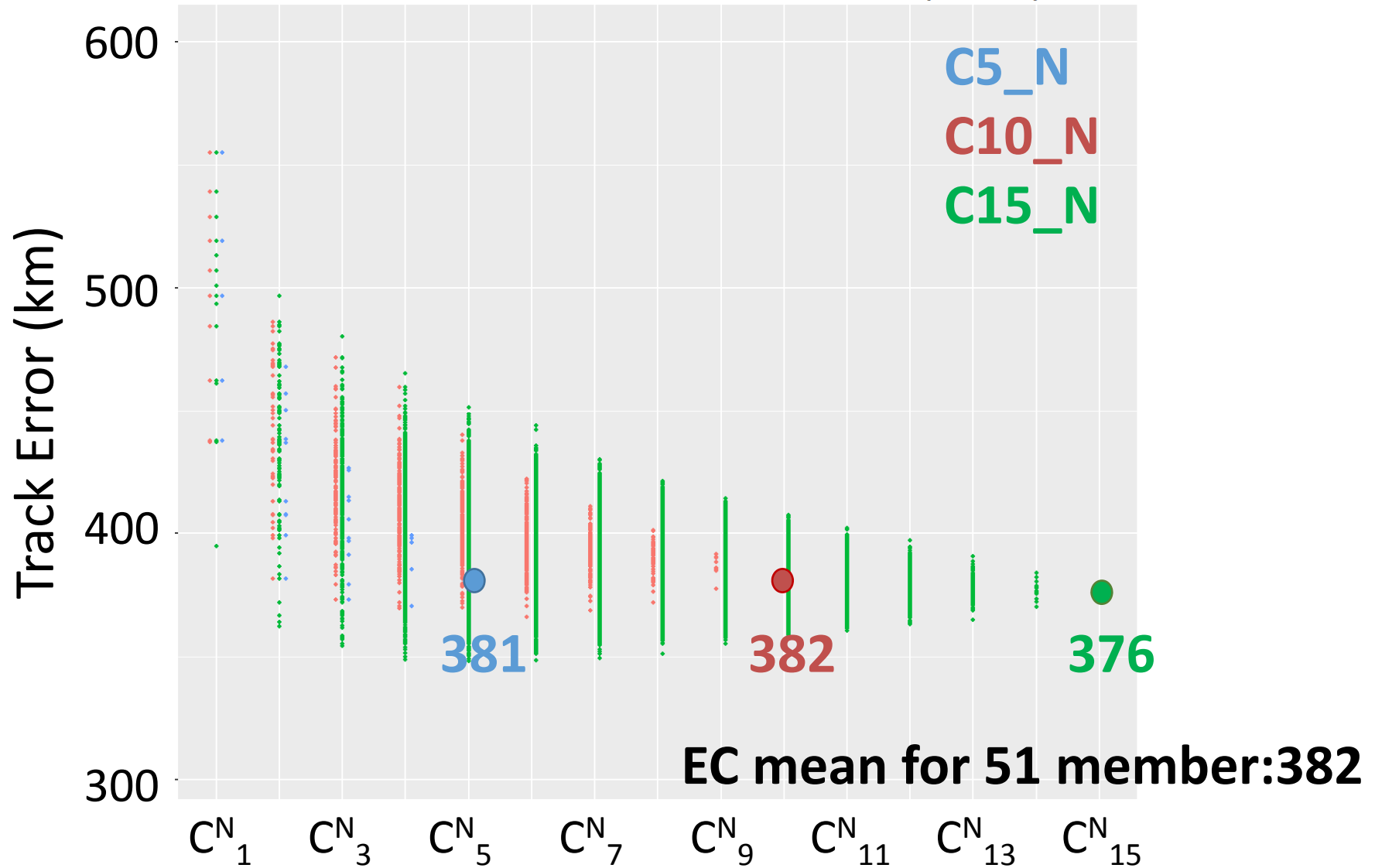




Combination for ECMWF – C5,C10,C15

Fcst 120h

Track Error for different Combination (2017)

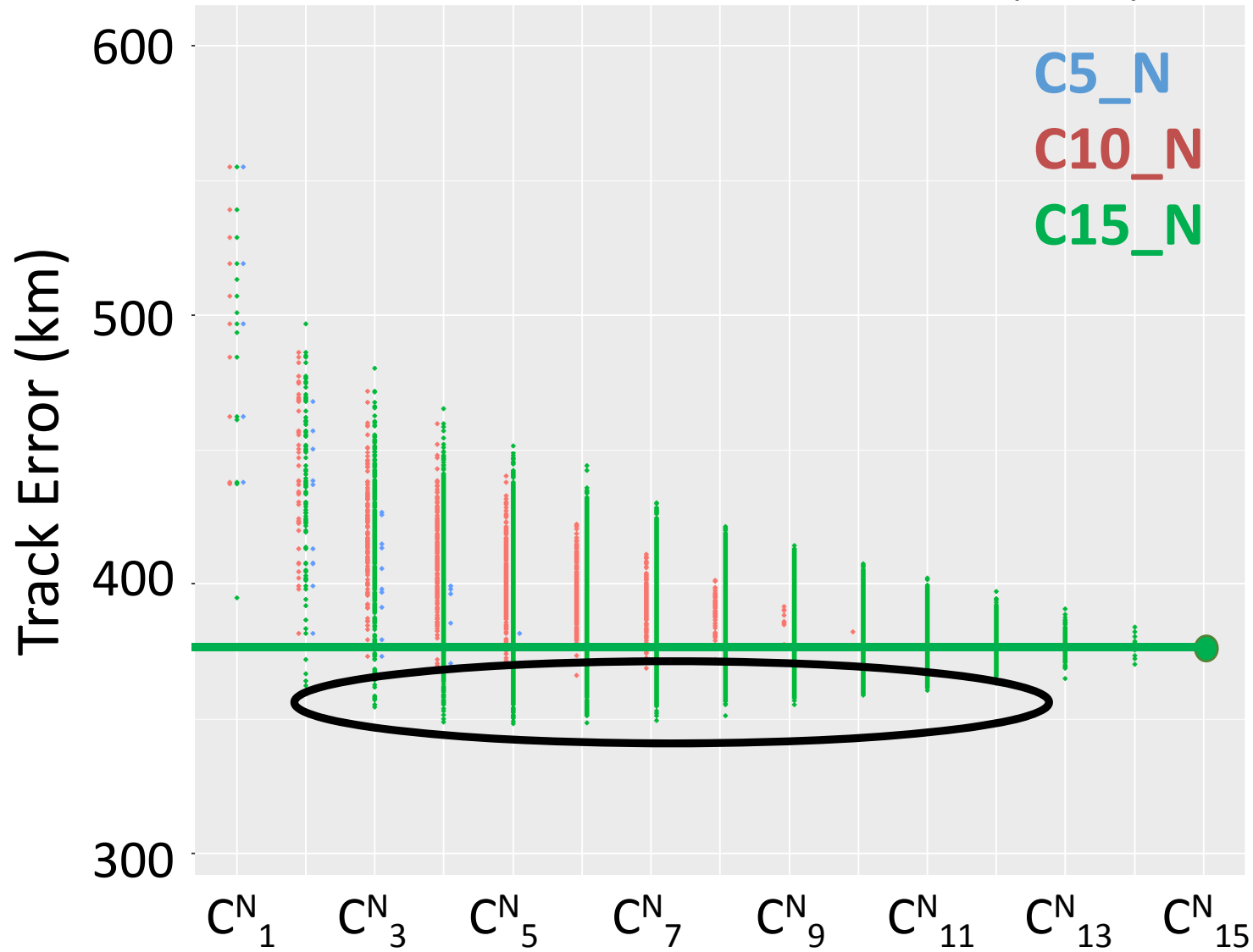




Combination for ECMWF – C5,C10,C15

Fcst 120h

Track Error for different Combination (2017)

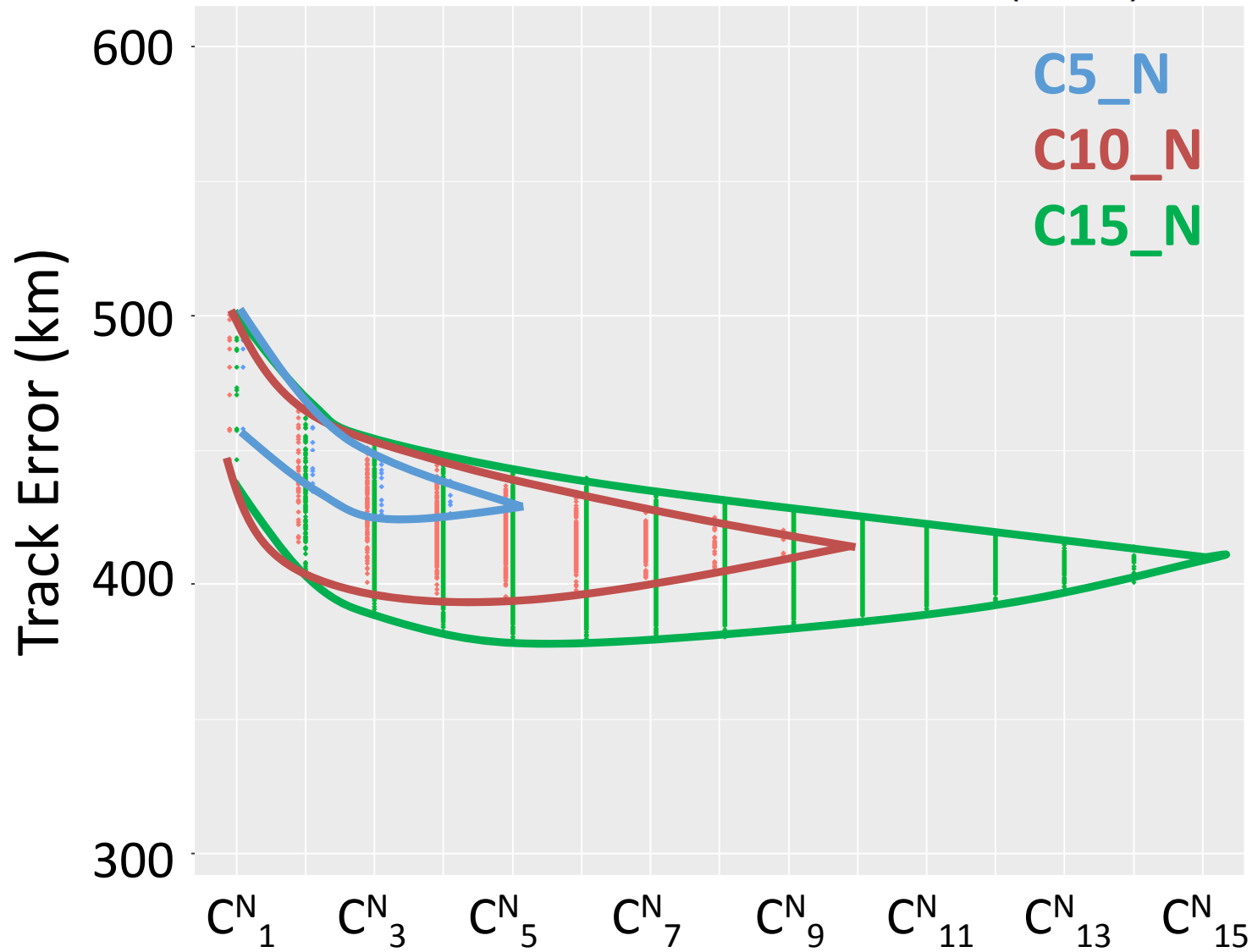




Combination for NCEP – C5,C10,C15

Fcst 120h

Track Error for different Combination (2017)

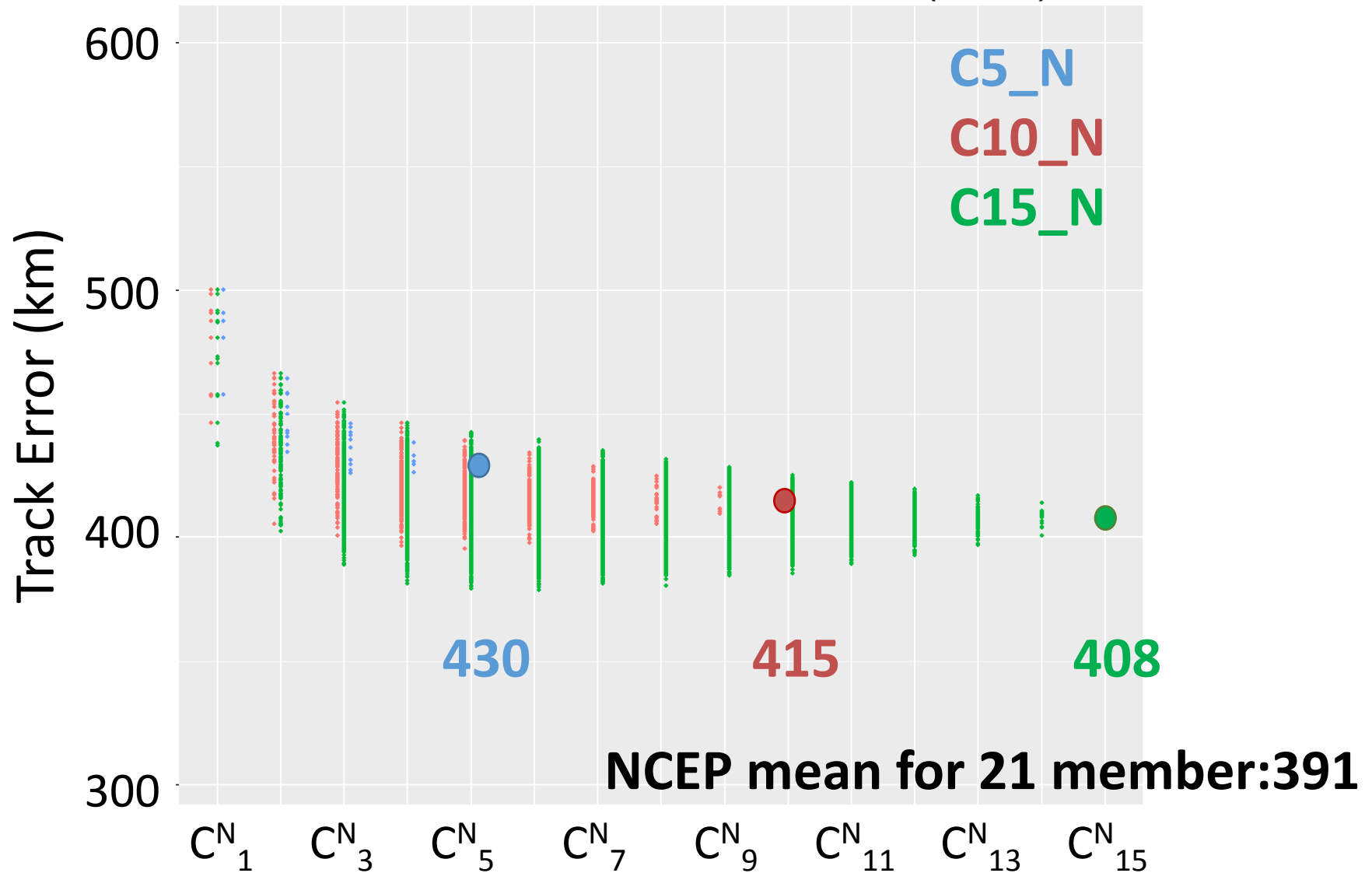




Combination for NCEP – C5,C10,C15

Fcst 120h

Track Error for different Combination (2017)

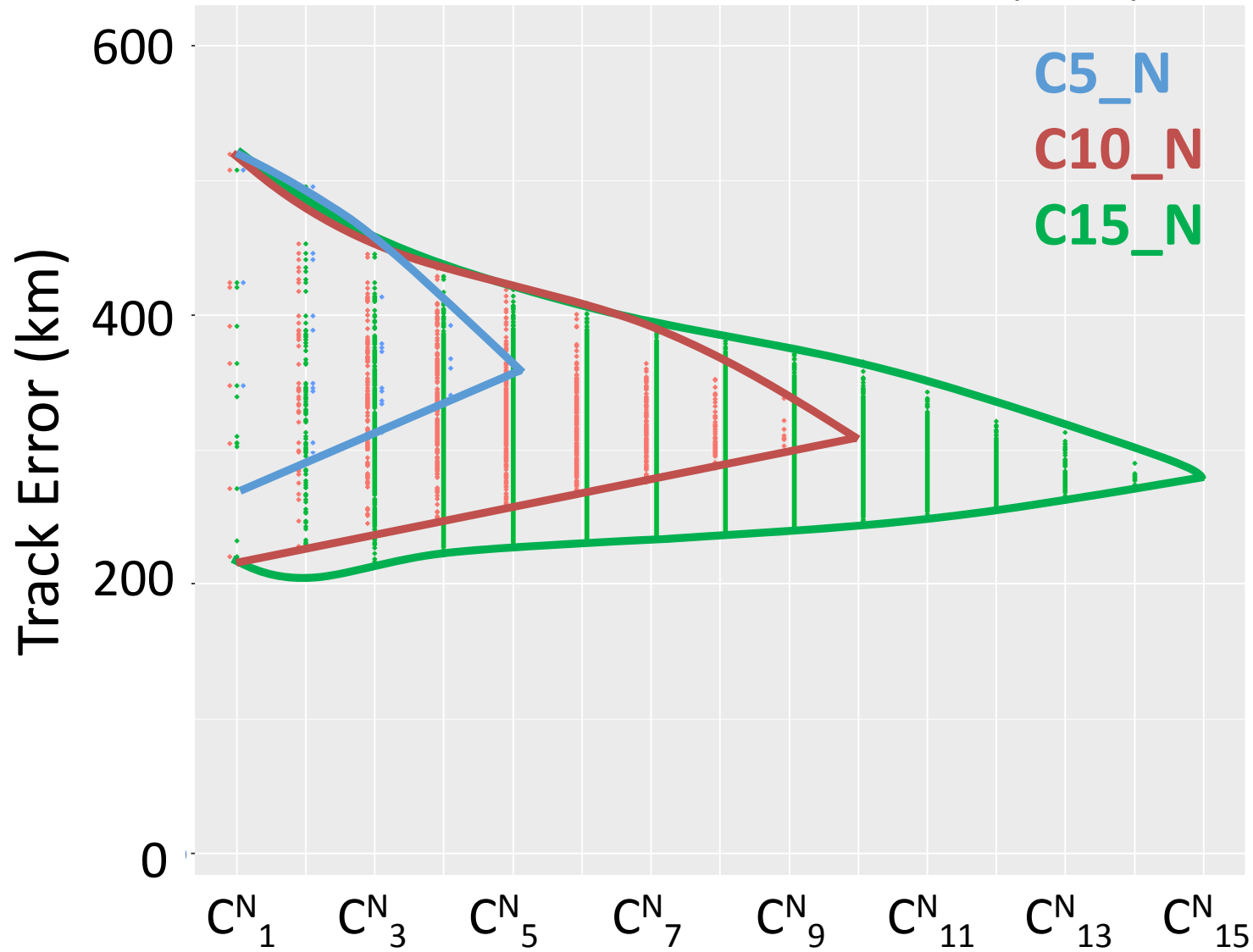




Combination for TAPEX – C5,C10,C15

Fcst 72h

Track Error for different Combination (2017)

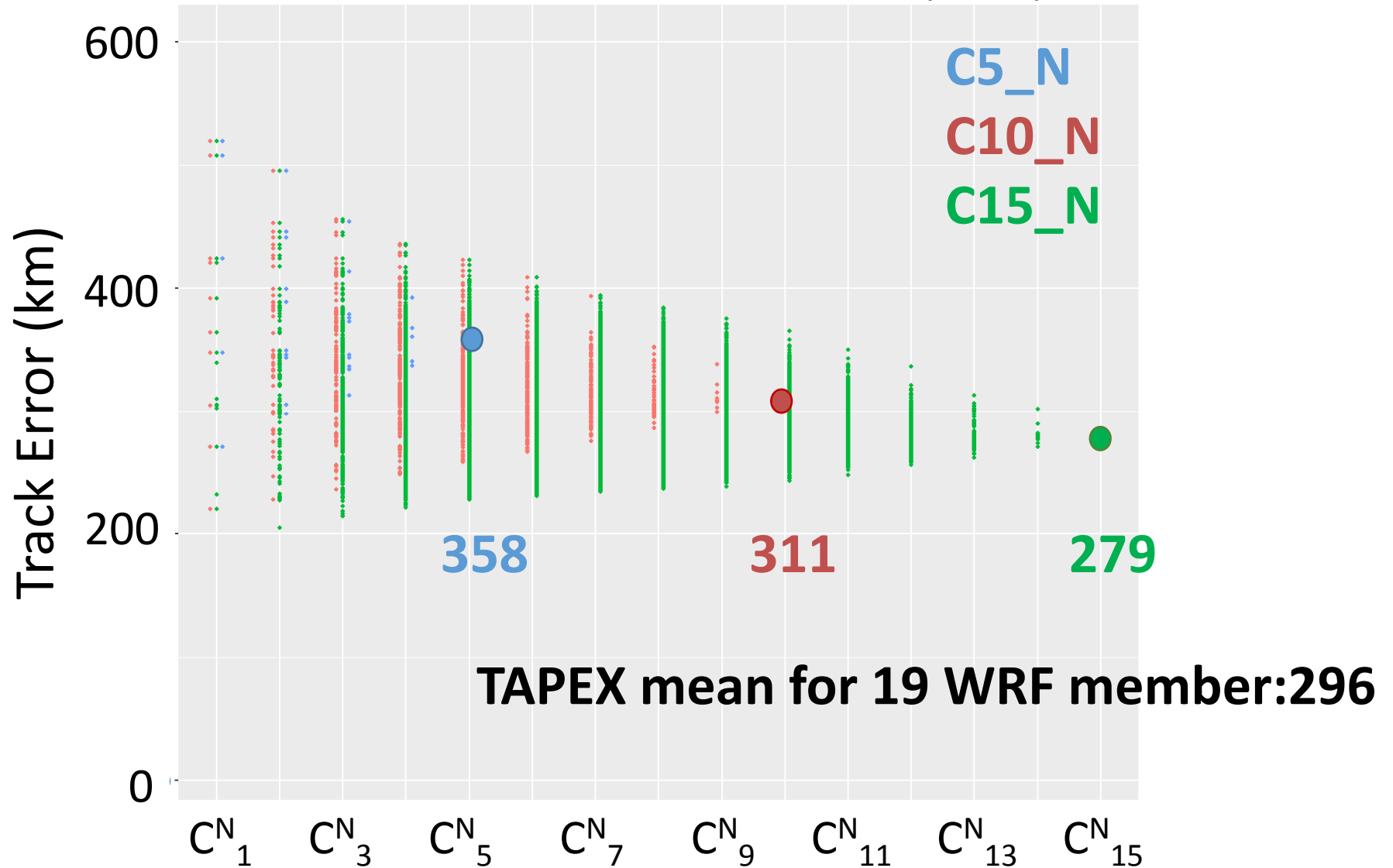




Combination for TAPEX – C5,C10,C15

Fcst 72h

Track Error for different Combination (2017)



A decorative graphic on the left side of the slide. It features a series of overlapping, wavy blue lines that create a sense of motion and depth. Scattered throughout this graphic are numerous small, light blue circles of varying sizes, some with dark outlines, resembling bubbles or particles. The overall effect is clean, modern, and professional.

Thank you for your attention