

Illustrating Ensemble Predictability Across Scales Associated with the February 13–15 2019 Storm

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Summary of Event and Impacts

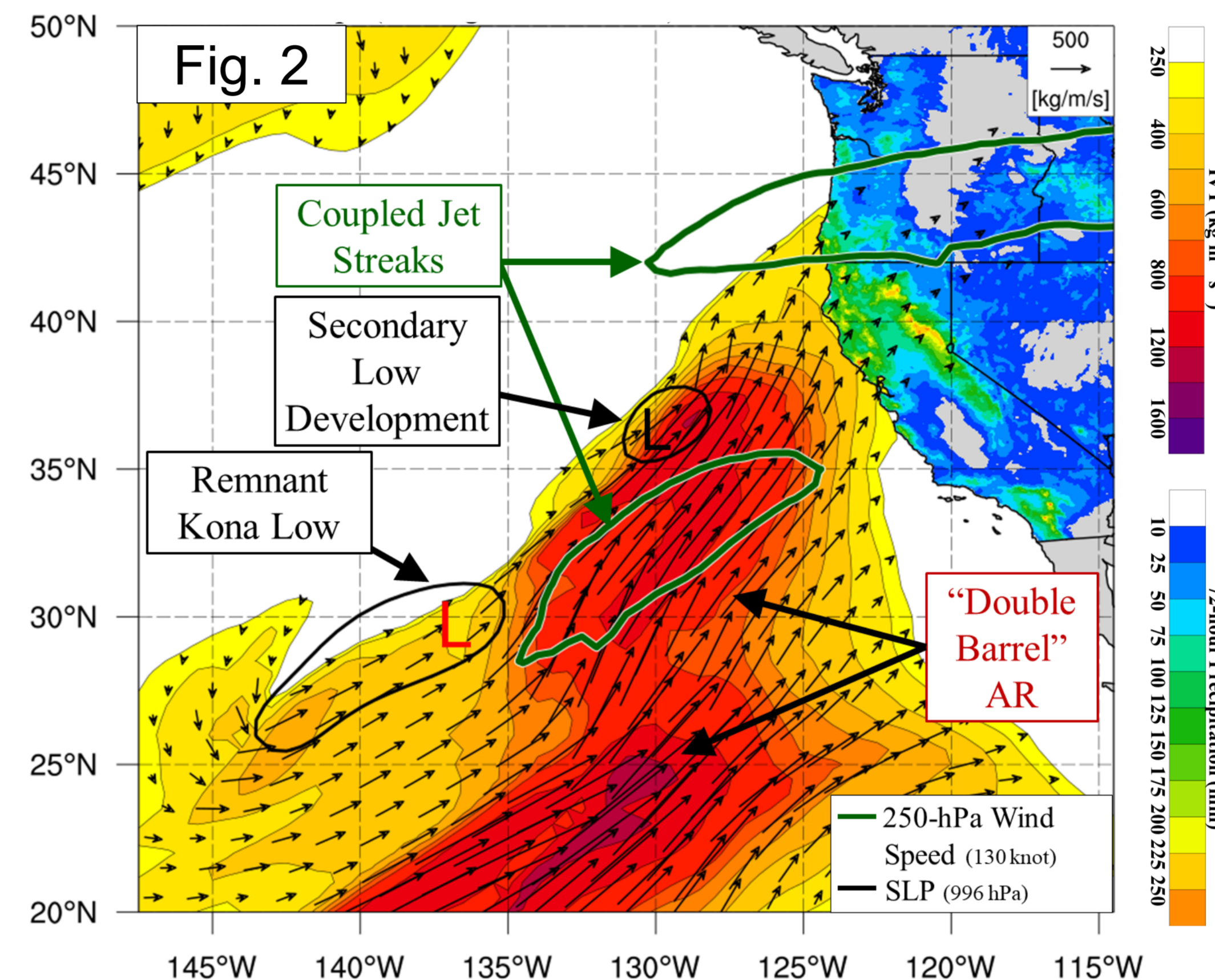
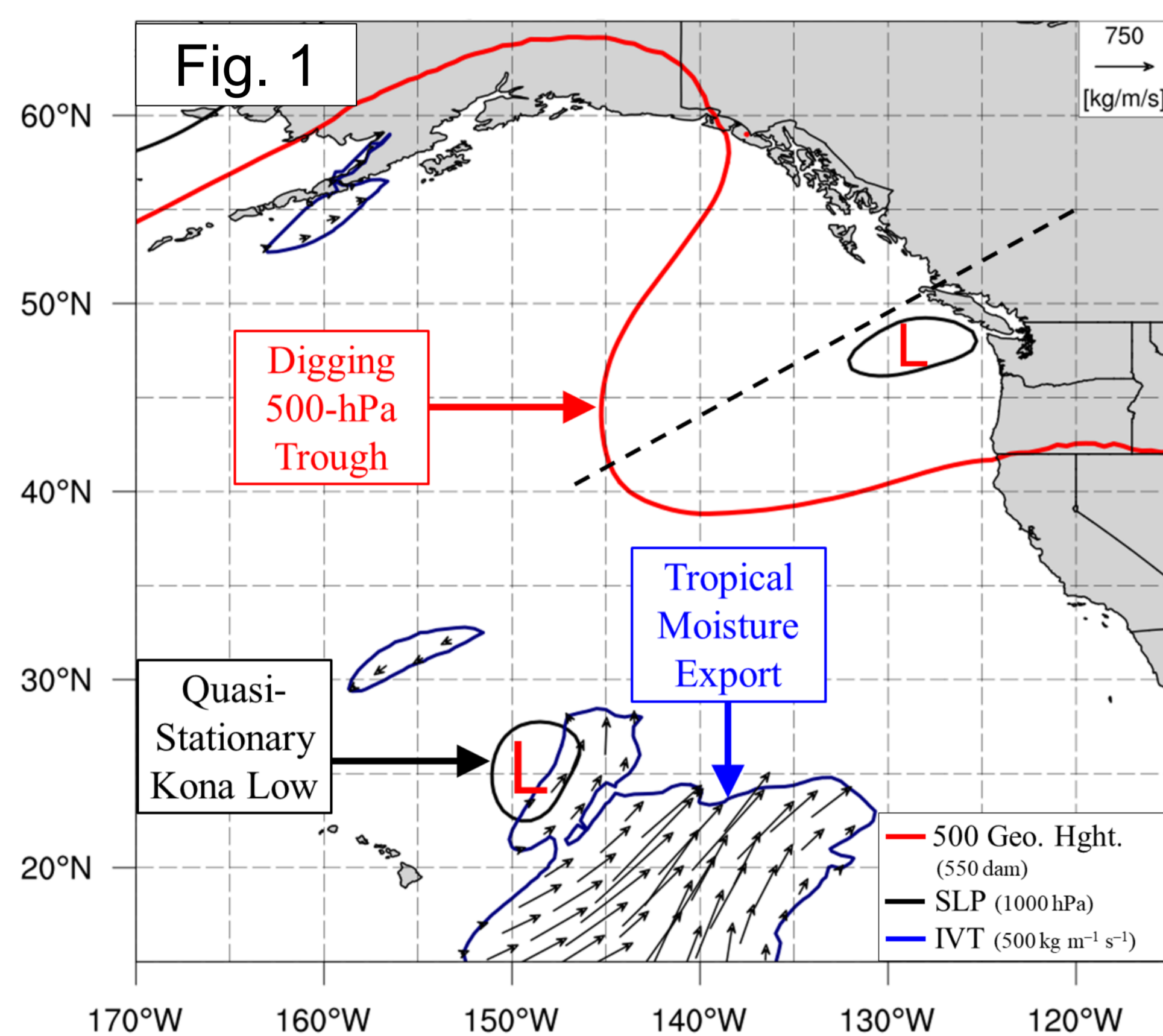
- “Valentine’s Day” atmospheric river (AR) affected much of U.S. West Coast from 13–15 February 2019, bringing AR3 (Ralph et al. 2019) conditions to most of California coast, reaching AR4 intensity along the southern-most region
- Several locations across the U.S. West experienced strong winds and heavy rainfall with some locations exceeding 10”
- The numerous dynamic features that led to this landfalling AR made this event unique and a forecast challenge

Synoptic and Mesoscale Evolution

- Quasi-stationary Kona Low northeast of Hawaii at 00 UTC 12 Feb. 2019; cyclonic circulation led to poleward tropical moisture export (TME) to the east (Fig. 1)
- Kona Low absorbed into mid-latitude flow via 500-hPa digging trough over Eastern Pacific (Fig. 1); propagated towards U.S. West Coast by 00 UTC 13 Feb. (Fig. 2)
- Moisture transport associated with TME strengthened with now mid-latitude low and extended northeastward becoming AR (Fig. 2)
- Secondary low-pressure center developed northeast of remnant Kona Low below dynamically favorable region of two jets (Fig. 2)
- Formation of secondary low led to development northeastward extending secondary AR corridor (Fig. 2)

GFS Analysis 500-hPa Geopotential Height, Sea-level Pressure, & Integrated Vapor Transport

Valid: 00 UTC 12 February 2019

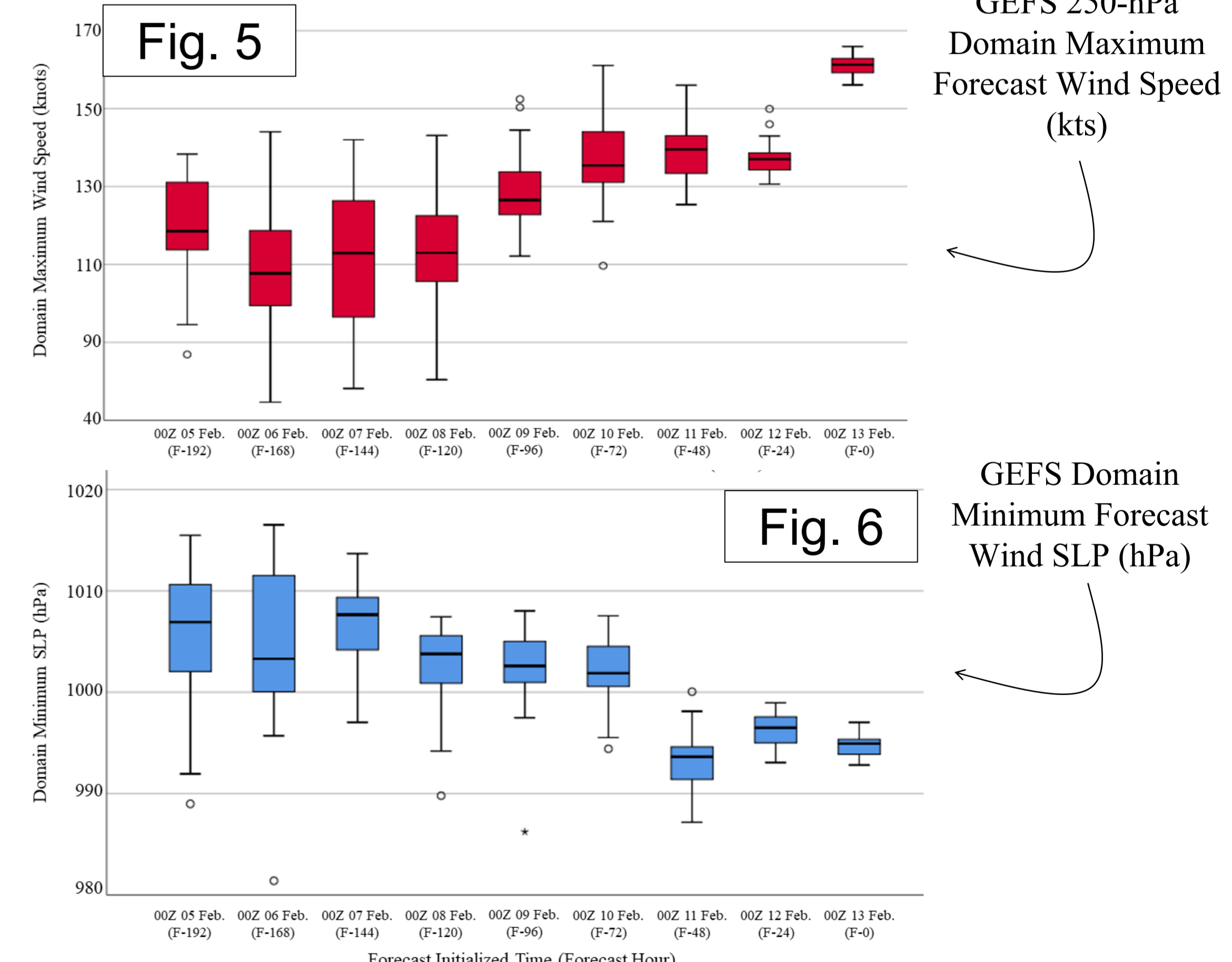
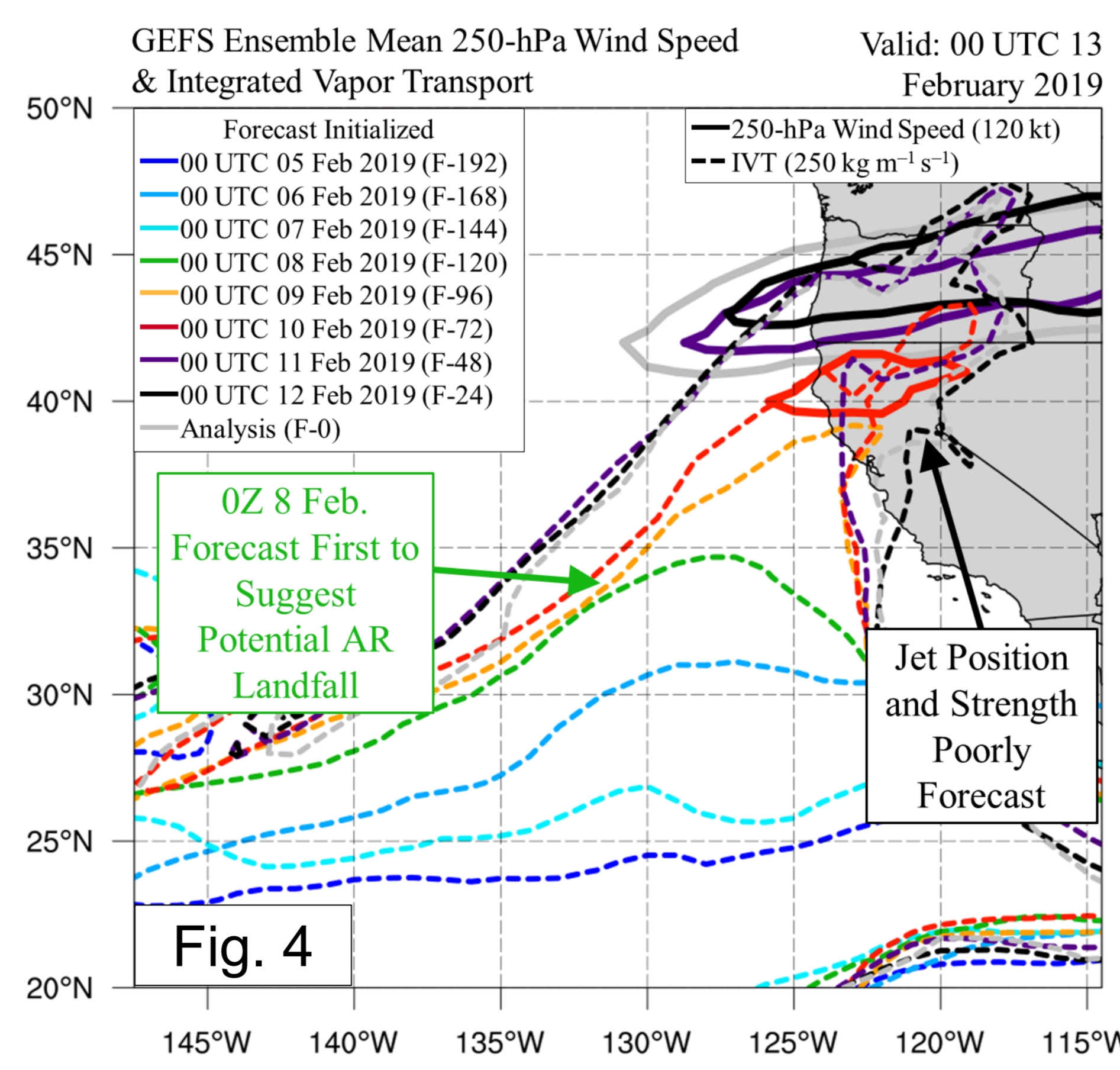
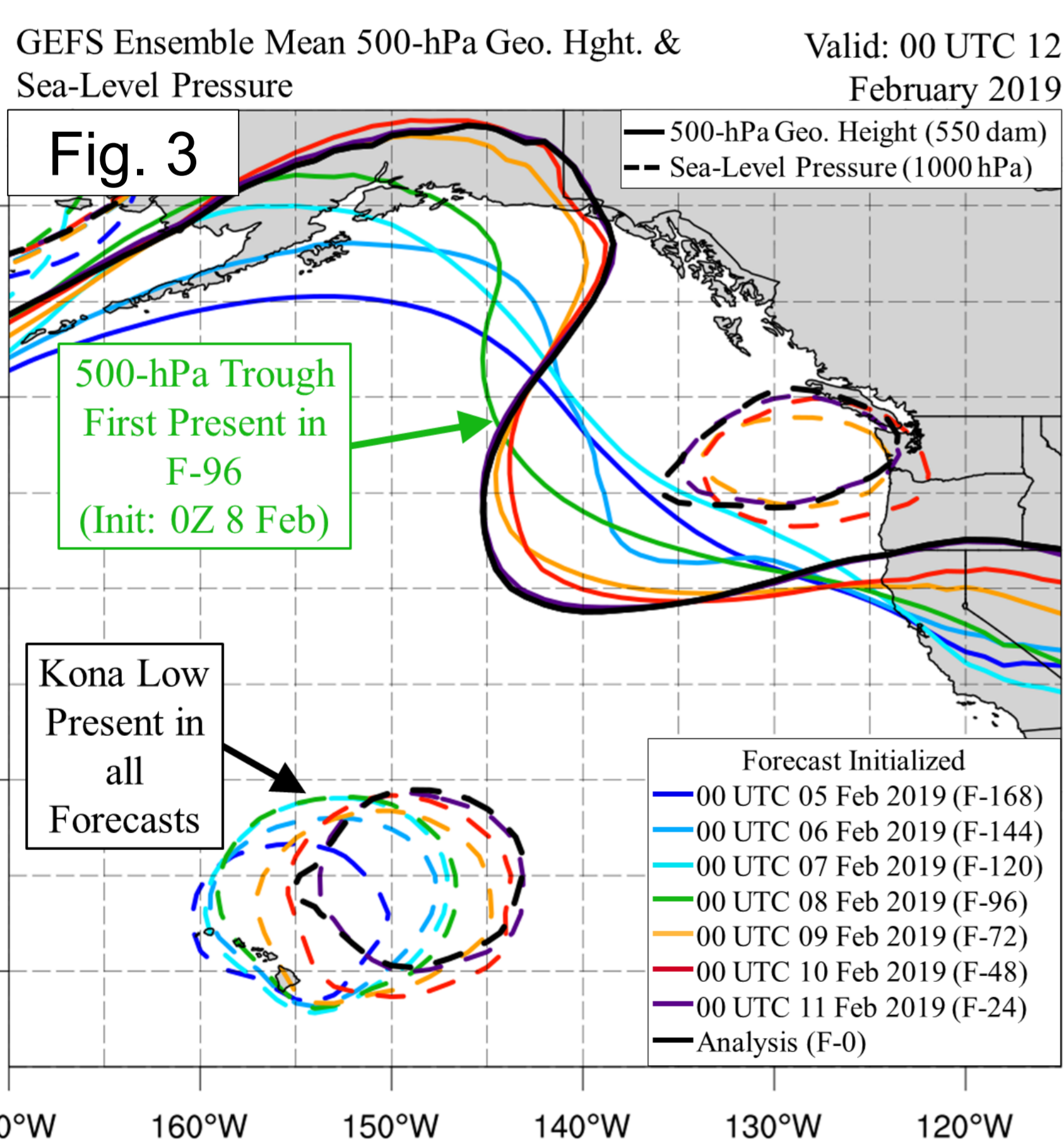


GFS Analysis IVT, Sea-level Pressure, 250-hPa Wind Speed, & 72-hr. Precip (Ending: 12Z 15 Feb.)

Valid: 00 UTC 13 February 2019

Forecast Highlights

- Kona low was present in all forecasts back to 168 hours (Fig. 3)
- First forecast to lock in on a digging 500-hPa trough was forecast initialized at 00 UTC 08 Feb. (F-96; Fig. 3)
- 0Z 08 Feb was also first forecast to identify a potential landfalling AR around 00 UTC 13 Feb. 2019 (Fig. 4)
- The 00 UTC 09 Feb forecast suggested development of jet over Pacific Northwest, but jet magnitude was under forecast, potentially leading to poor secondary low forecast (Fig. 4, 5, & 6)
- Poor forecast of secondary low development led to under forecast of AR conditions over northern CA due to the northward IVT extension and prolonged AR duration



Concluding Remarks and Future Work

- While forecasting the digging 500-hPa trough off North American Coast was first step in identifying AR landfall, there were important meso- to synoptic scale features that developed during event (e.g., secondary low) that resulted in this event being poorly forecast

- Future work is aimed at utilizing full ECMWF ensemble while incorporating statistical and spatial forecast metrics to further quantify forecast performance of various features