

Brussels Office: Avenue de Tervuren 188A, B-1150 Brussels, Belgium

Houston Office: 19219 Katy Freeway, Suite 175, Houston, TX 77094, USA

# Improving Tropical Cyclone Forecasts

The JIP aims to improve the estimation of risk of wind and wave impacts in the 10-day forecast window for the Australian region using computer model guidance.

Chevron	woodside				
Australian Bureau of Meteorology	(BoM)				
likely track and intensity in a 3-5 c operational response often requir dependent not only on the most li scenario. Industry practice may re	aditionally focused on describing the most day forecast horizon. However, industry's res much longer lead time and can be kely outcome but also the 'worst case' esult in Operators taking unnecessary pose no threat, so called 'false positives', and safety exposure.				
A two fold approach has been undertaken for the Western Australian region. First, the deterministic computer model guidance is improved by running at a higher resolution, having parameters specifically tuned to improve tropical cyclone forecast skill, and building a wave forecast model to utilize the outputs from the wind forecast model.					
Secondly, multiple (51) computer models runs that are generated twice per day have been re-calibrated to ensure there is no wind intensity or size biases in the forecast. Based on these wind forecasts multiple (51) wave model forecasts are produced.	Ensemble Bias Correction Wind fore casts Wave fore casts Raw model wind field Bias-corrected wind field Downstream processing				
	Australian Bureau of Meteorology Tropical cyclone forecasts have the likely track and intensity in a 3-5 of operational response often required dependent not only on the most listic scenario. Industry practice may re- actions for tropical systems that provide the systems that are generated twice per day have been re-calibrated to ensure there is no wind intensity or size biases in the forecast. Based on these wind forecasts multiple (51) wave model				

T +32 (0)2 790 7762

T +1 (713) 261 0411

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## What is the solution:

Each operator is now able to establish the risk of wind and wave thresholds being exceeded at nominated facility locations at 6 hourly time steps out to 10 days ahead.

### Progress to date:

The high resolution deterministic wind and wave models have been developed and implemented in operational mode, and have shown a moderate improvement in forecast skill.

A calibration strategy has been developed and implemented to correct forecast errors in the multiple (51) computer wind models, and the outputs have been used to drive the wave model. The operational products have been in place for two Australian tropical cyclone seasons and operators have utilized the outputs to inform response decision making during events. An example of the BoM 'risk' product, showing the risk of gales as a system approaches, is shown below.

DATE	12 Mon	13 Tue	14 Wed	15 Thu	16 Fri	17 Sat	18 Sun	19 Mon	20 Tue
111112 (1101)	00-06 06-12 12-18 18-24	00-06 06-12 12-18 1	8-24 00-06 06-12 12-18 18-24	00-06 06-12 12-18 18-24	00-06 06-12 12-18 18-24	00-06 06-12 12-18 18-24	00-06 06-12 12-18 18-24	00-06 06-12 12-18 18-24	00-06 06-12 12-18 18-24
08	KGD					2 5 6	11 13 15 15	19 25 26 24	27 29 26 19
12 Mon 20	NOF					2 3 4	8 7 10 10	14 23 25 27	27 35 29 24
08						1 3 8 9	11 15 15 19	22 25 27 23	25 25 22 18
12 Mon 20	UNIA					2 5 6	9 11 12 13	17 25 28 25	27 27 25 21
08	NIDC					2 5 8	10 13 14 17	20 21 23 22	23 23 21 17
12 Mon 20	NIC					1 3 6	7 9 11 11	16 22 25 22	24 25 20 18
08	NY/NG						2 2	5 5 7 7	7 7 8 10
12 Mon 20							1	3 3 5 5	5 9 11 12
0%	Very Low	(1% - 5%)	Low (5% - 20%)	Moderate/Hi	gh (20% - 100%)	Day (06:00-1	3:00) Nig	ht (18:00-06:00)	No Data

### Next steps:

Operators and forecasters are gaining experience of using the new 'risk' products with positive impacts on the safety and efficiency of operations. For example, Woodside was able to avoid discontinuing operations for STC Marcus in March 2018 because there was demonstrated to be no risk of impact at its facilities, whilst under previous response procedures, the facilities would have been shut-in and FPSOs disconnected, with the associated risk to personnel in disconnecting and reconnecting the FPSOs.

For more information contact Lucyna Kryla-Straszewska, lks@iogp.org

Registered Office: City Tower, Level 14, 40 Basinghall Street, London EC2V 5DE, United Kingdom Brussels Office: Avenue de Tervuren 188A, B-1150 Brussels, Belgium Houston Office: 19219 Katy Freeway, Suite 175, Houston, TX 77094, USA

T +44 (0)20 3763 9700 T +32 (0)2 790 7762 T +1 (713) 261 0411