



Enhancements to the SHIPS Rapid Intensification Index

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1. Background

➤ SHIPS RI index (SHIPS-RII) is a statistically-based tool that was developed to aid in forecasting RI events which remains a top forecasting priority of the NHC.

➤ SHIPS-RII uses mainly environmental and a few GOES inner-core SHIPS model predictors to estimate the probability of RI from t=0 to t=24-h utilizing linear discriminant analysis. (Kaplan et al. 2010).

➤ SHIPS-RII is currently used as an operational forecasting tool at the NHC for both the Atlantic and E. Pacific basins.

2. Project Goals

➤ Develop new multi-lead time (12-h, 24-h, 36-h, and 48-h) consensus RI models (Rozoff and Kossin 2011).

➤ Utilize new multi-lead time consensus RI models to develop new versions of the deterministic rapid intensity aid guidance (Sampson et al. 2011).

➤ *Derive new microwave-based RI models (see previously presented conference poster by Rozoff et al. 2014).*

3. Methodology

➤ Multi-lead time (12-h, 24-h, 36-h and 48-h) RI models were derived using 1995-2012 SHIPS developmental data for both the Atlantic and E. Pacific basins.

➤ Consensus RI model is the average of RI probabilities from SHIPS, Bayesian, and Logistics- regression versions of the RI model.

➤ Multi-lead time RI model was run in real-time at CIRA/CSU from ~August 1 to Nov 30 of the 2013 Hurricane Season (see sample output in Fig. 1).

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***** SECTION 1, 2013 OPERATIONAL RI WITH *****
TPM, IAPC, CFLUX ENHANCEMENTS
** 2013 ATLANTIC RI INDEX AL092013 AL09 09/10/13 18 UTC **
+ 10 KT OR MORE MAX WIND INCREASE IN NEXT 24 HR +
12 HR PERSISTENCE (RT) : 5.0 Range=-49.5 to 33.0 Scaled/Npted Val: 0.7/ 1.9
850-200 MB SHEAR (RT) : 7.9 Range= 28.8 to 2.9 Scaled/Npted Val: 0.8/ 1.1
200 MB OF 12 HR TEND : 13.4 Range= 37.5 to 2.9 Scaled/Npted Val: 0.4/ 0.8
240 KT OF 12 HR TEND : -0.6 Range= 2.4 to -3.1 Scaled/Npted Val: 0.5/ 0.8
HEAT FLUX (RT) : 4.0 Range= 0.0 to 150.1 Scaled/Npted Val: 0.5/ 0.0
MAXIMUM WIND (kt) : 60.0 Range= 22.0 to 121.0 Scaled/Npted Val: 1.0/ 0.4
200 - 700 HPA (RT) : 85.0 Range= 28.4 to 139.1 Scaled/Npted Val: 0.2/ 0.2
CDO (10**7m) : 70.8 Range=-23.1 to 181.5 Scaled/Npted Val: 0.5/ 0.3
4 AMSR-2 T87 T85 (RT) : 0.0 Range=100.0 to 0.0 Scaled/Npted Val: 1.0/ 0.4
RI CDO-ATR FLUX (w/m2) : 157.4 Range=160.3 to -47.2 Scaled/Npted Val: 0.8/ 0.0
Prob of RI for 20 kt RI threshold: 2.9 2.2 times the sample mean (11.9%)
Prob of RI for 30 kt RI threshold: 1.6 1.6 times the sample mean (7.4%)
Prob of RI for 40 kt RI threshold: 1.0 1.0 times the sample mean (4.3%)
Prob of RI for 50 kt RI threshold: 0.4 0.4 times the sample mean (1.6%)
Prob of RI for 60 kt RI threshold: 0.0 0.0 times the sample mean (0.0%)
***** SECTION 2, RI WITH LIGHTNING DATA *****
FOR GOES-R PROVING GROUND
AL09 Initial vmax, lat, lon: 60, 14.7 -27.9 Date/Time: 13 0910 18
Probability Rapid Intensification= 12% no lightning, experimental algorithm
Probability Rapid Intensification= 14% with lightning, experimental algorithm
Rapid Intensification (RI) = +30 kt or more max wind change in 24 hr
Predictor Name Normalized Value Prob Contribution
Climatology 0.0 5.5
SST Potential -0.8 -2.8
850-200 hPa Shear -0.8 -1.5
200 hPa Divergence 1.0 -0.1
Persistence 0.3 1.3
GOES-16 Cold Pixel 0.7 2.2
GOES-16 Asymmetry -0.4 0.7
Ocean Heat Content -1.3 0.4
850-700 hPa SLP 1.6 2.2
CAPE Vorticity Tendency 0.8 2.0
Near Core Lightning -0.9 2.3
Outer Lightning -0.5 -1.3
Recent Lightning Density History (Strokes/m2-year)
Near Core (0-200 km) Outer Region (200-400 km)
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