The Advanced Dvorak Technique (ADT): Latest Upgrades and Enhancements

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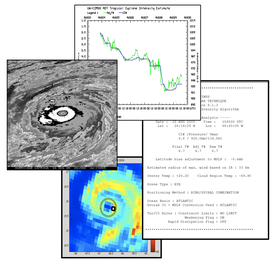
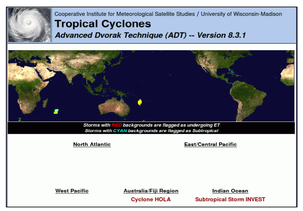
Algorithm Information

Background

The UW-CIMSS Advanced Dvorak Technique (ADT) is a mature algorithm utilized to objectively estimate the intensity of tropical cyclones using geostationary infrared data and polar-orbiting passive microwave data. It is based upon the subjective Dvorak Technique, but is computer-based and has advanced beyond the scope of the original DT methodology and rules. The ADT is currently used around the globe by many operational Tropical Cyclone Forecast Centers.



Current Status



The current operational version of the ADT (v8.2.1) is run at the NOAA Satellite Analysis Branch (SAB) in Washington DC for all global TCs. ADT intensity estimates are available at:

http://www.ssd.noaa.gov/PS/TROP/adt.html

The experimental ADT v9.0, containing all of the upgrades described in this poster, has just completed internal testing and evaluation at CIMSS. ADT v9.0 will be delivered to NOAA/SAB for implementation and testing during the upcoming 2018 TC season (non-operational mode), and should become operational in 2019. User access to a licensed copy of v9.0 will also be available in 2019. The UW-CIMSS TC website (below) will have demonstrational v9.0 estimates starting this season.

Website

ADT intensity estimates and product information can be found on the CIMSS Tropical Cyclone website at :

http://tropic.ssec.wisc.edu/real-time/adt

Acknowledgements

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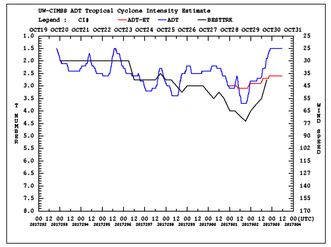
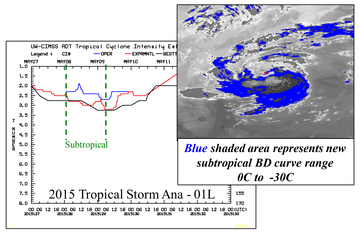
Latest Upgrades

TCs undergoing Extratropical Transition

Research led by Clark Evans from UW-Milwaukee has resulted in a regression-based adjustment scheme for the ADT intensity estimates on TCs undergoing ET. This adjustment (usually about 1 T# increase) utilizes the FSU/Bob Hart real-time cyclone phase space information to identify and trigger when the ET begins.



Subtropical Storm Analysis

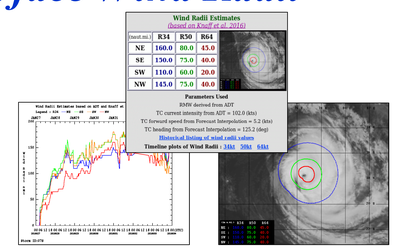


Blue shaded area represents new subtropical BD curve range 0C to -30C

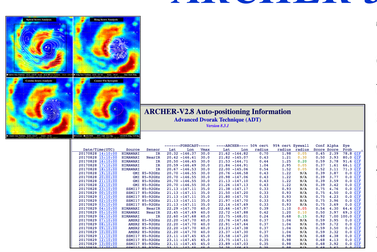
Another enhancement requested by ADT users is the ability to operate on subtropical systems. If a system is designated as 'Subtropical' by NHC or JTWC, a modification to the ADT Curved Band scene type analysis scheme is invoked to provide adjusted intensity estimates for the subtropical system.

Estimation of Surface Wind Radii

An algorithm developed by John Knaff at NOAA/RAMMB has been implemented within the ADT to provide continuous and objective estimates of four-quadrant surface wind field radii (34/50/64 kt) utilizing IR satellite imagery signatures along with ADT analysis parameters.



ARCHER 3.0 Integration



The ADT automated storm center determination process has been updated to utilize the advanced ARCHER 3.0 algorithm. TC center positions will be objectively derived in real time using a weighted combination of LW-infrared, SW-infrared, visible and microwave imagery, as well as scatterometer data.

Algorithm Performance

The performance of the ADT during the 2017 TC season has been validated storm-by-storm and TC basin-wide vs. Best Track data from NHC (ATL/EPAC), CPHC (CPAC) and JTWC (all other TC basins). The Atlantic basin NHC BT matches require coincident reconnaissance aircraft data. Validation statistics for all TC basins (three are shown here) include estimates of Vmax (kts) and MSLP (hPa).

W Pacific - 513 total matches

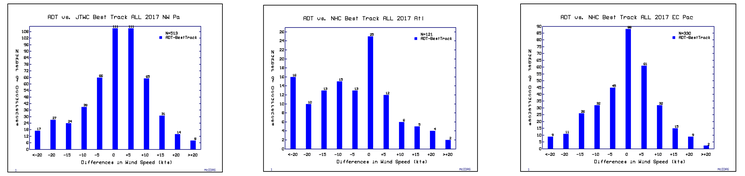
	bias	aae	stdv
CI#	0.06	0.46	0.59
Wind(kts)	0.39	8.37	10.99
MSLP(mb)	1.03	5.25	6.99

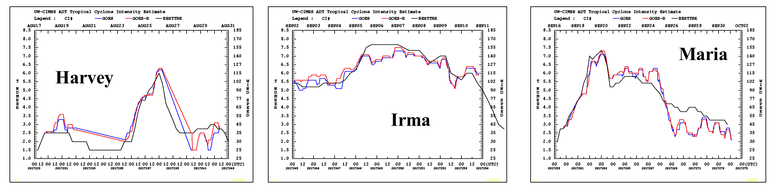
Atlantic - 124 total matches

	bias	aae	stdv
CI#	-0.18	0.50	0.62
Wind(kts)	-4.15	11.43	13.87
MSLP(mb)	4.37	8.57	9.84

E/C Pacific - 330 total matches

	bias	aae	stdv
CI#	-0.01	0.42	0.55
Wind(kts)	-0.73	7.58	10.05
MSLP(mb)	1.13	5.02	6.44





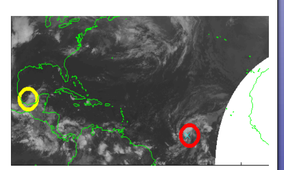
ADT comparisons using GOES-16 vs. GOES-13

Takeaway: Slightly higher T# at times with GOES-16 due to higher spatial res. and S/N, but generally close agreement

Future Work

Analysis of Pre-Genesis Disturbances

Develop a scheme to objectively identify, track and analyze pre-TD systems using satellite imagery and Dvorak T# statistics compiled by Josh Cosseth (NRL). The algorithm will serve as a 'front end' to the ADT to help objectively classify systems in their formative stages.



Related Posters at this Conference

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P. 246 A Reanalysis of Australian Region Tropical Cyclones in the Geostationary Satellite Era. Part 1: Intensity, using the objective Advanced Dvorak Technique (ADT), Velden et al.

P. 256 Part 2: Wind radii parameters using the Deviation Angle Variance Technique (DAV-T), Stark et al.

P. 284 An Update on the CIMSS SATCON Tropical Cyclone Intensity Algorithm, Herndon and Velden