P1.9 ASPECTS OF THE TROPICAL CYCLONE PROGRAM OF NOAA/NESDIS

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1. INTRODUCTION

NOAA/NESDIS Satellite Services Division (SSD) has been deriving the position and intensity of tropical disturbances around the world using the internationally recognized Dvorak technique for more than 25 years. These estimates continue to be disseminated today to weather agencies of the international community as well as tropical cyclone warning centers such as the Tropical Prediction Center (TPC), the Central Pacific Hurricane Center (CPHC) and the Joint Typhoon Warning Center (JTWC). Several aspects of the NOAA/NESDIS program are provided with a special emphasis given to a variety of tools used to generate the analyses including objective intensity techniques developed at the Cooperative Institute for Meteorological Satellite Studies (CIMSS) and an areal Tropical Rainfall Potential (TRaP) derived from microwave data.

2. TROPICAL CYCLONE PRODUCTS

Position and intensity estimates are derived every six hours using a variety of satellite data: United States Geostationary Operational Environmental Satellites (GOES), European Geosynchronous Meteorology Satellites (METEOSAT), Japanese Geostationary Meteorological Satellite (GMS), Defense Meteorological Satellite Program's (DMSP) Special Sensor Microwave Imager (SSM/I) 85 GHz, rain rate and precipitable water data, National Aeronautics and Space Administration's (NASA) Tropical Rainfall Measuring Mission (TRMM) microwave imager 85 GHz and rain rate data, NOAA Polar Orbiting Operational Environmental Satellites (POES) Advanced Microwave Sounder Unit (AMSU) 89 GHz and rain rate data and the NASA/Jet Propulsion Laboratory's (JPL) SeaWinds scatterometer data from the QuikSCAT satellite.
Examples of some of these satellite data sets over the Western Hemisphere can be found on the SSD Tropical Cyclone Page: http://www.ssd.noaa.gov/PS/TROP/

Satellite intensity and position estimates are disseminated via telephone coordination in the Western Hemisphere with the Tropical Predication Center (TPC) in Miami, Florida, and the Central Pacific Hurricane Center (CPHC) in Honolulu, Hawaii, at 0030Z, 0630Z, 1230Z, and 1830Z. Estimates performed in the Eastern Hemisphere are disseminated using the Global Telecommunications System (GTS) by 0400Z, 1000Z, 1600Z and 2200Z. Meteorological users in the Eastern Hemisphere may also receive a summary of significant convective activity in the tropical regions of the Indian Ocean twice a day and disseminated by 1000Z and 2200Z. The convection is described in terms of intensity and trend over a 24 hour period. All of these products are also available on the SSD Tropical Cyclone Page. The GTS headers for these NOAA/NESDIS tropical cyclone Satellite Weather Bulletins and Indian Ocean Summaries can be found in Table 1.

TABLE 1

GTS HEADER	LOCATION
WWPN20 KWBC	NW Pacific
WWPS20 KWBC	S Pacific
WWIO20 KWBC	N Indian Ocean
WWIO21 KWBC	S Indian Ocean
TCIO10 KWBC TCIO11 KWBC	Indian Ocean Summary

3. ACCURACY OF ESTIMATES

SSD tropical cyclone estimates for the Western Hemisphere are compared annually against available reconnaissance-based pressure measurements (hereafter recon) which are converted to T-numbers based on Dvorak (1984). Intensity estimates made within one to as many as two hours of reconnaissance

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observations are compared. Eighty-three estimates met this requirement during the 2001 Atlantic and East Pacific hurricane seasons. Nearly half of the estimates (46%) agreed with recon and 86% of estimates were within ½ T-number. The remaining 14% differed by a whole T-number.

4. CIMSS OBJECTIVE INTENSITY ESTIMATES

Through an ongoing relationship with the CIMSS, University of Wisconsin, the SSD has acquired two types of objective aid for the tropical analyst: an Objective Dvorak Technique (ODT) for tropical cyclones of hurricane intensity and experimental AMSU tropical cyclone intensity estimates.

A comparison of the ODT output made within an hour of recon during the 2001 Atlantic and East Pacific hurricane seasons showed that 88% of classifications were within a ½ T-number of recon with 41% agreeing. Twelve percent differed from recon by a whole T-number.

CIMSS Experimental AMSU Tropical Cyclone Intensity Estimates have been made available to the SSD for the Atlantic via e-mail since the summer of 2000 and for the entire globe as of 2002. These estimates are not currently being incorporated into operations as they are still experimental and improvements are ongoing. However, the results for the 2001 Atlantic and East Pacific hurricane seasons look quite promising with 75% of (raw) estimates within 10 hPa of recon. The technique is particularly advantageous in that it is valid during all stages of development of a tropical cyclone.

5. AREAL TROPICAL RAINFALL POTENTIAL

The experimental Tropical Rainfall Potential (TRaP) using satellite data has been performed operationally in the SSD since the mid-1980s. The launch in the late 1980s by the military of the first microwave imager (SSM/I) under their DMSP started a new era for the TRaP technique. See Kidder et al. (2001) for a description of the history and execution of the technique since that time.

Today the process incorporates a satellite-based observation of instantaneous rain rates (AMSU-B, SSM/I, TRMM, etc...) projected over time using official track forecasts (TPC, CPHC, JTWC) to determine a rain rate over any point . Rain amounts are then integrated for every point in the image over a 24 hour period and the result is displayed graphically on the SSD Tropical Cyclone Page. Current manual production of the areal TRaP begins within 36 hours of landfall with updates made as new forecasts or rain rate data become available right up to the point of landfall. SSD is tasked with providing this product to several NWS agencies including TPC, CPHC, various forecast offices, and the Climate Analysis Center for use in their African Threats Assessment. In addition SSD has forged partnerships with meteorological centers in foreign countries such as Australia, Canada and Sri Lanka to extend TRaP generation to these areas on an experimental basis. It is anticipated that the areal TRaP will become a fully automated global product later in 2002 at which time it will run throughout the life history of a storm. A TRaP verification example for Hurricane Allison is found at http://www.ssd.noaa.gov/PS/TROP/NWAOct2001a.ppt . Another example will be on display and others are available from the SSD Tropical Cyclone Page and from the author.

6. REFERENCES

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