PROCEDURES ESTABLISHED BY THE NATIONAL WEATHER SERVICE FORECAST OFFICE NEW ORLEANS/BATON ROUGE LOUISIANA REGARDING THE OPERATIONAL HEAT STRESS ASSESSMENT SYSTEM

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1. INTRODUCTION

Excessive heat has been a stifling influence over the past century with the severity of its wrath only now coming to fruition. Each year during the summer season, people are falling victim to severe heat disorders. In fact, during a normal year, around 175 people die from over-exposure to extreme torrid temperatures. As a result, scientists (predominantly climatologists and meteorologists) have been examining this phenomena more closely in an effort to lessen these unfortunate results.

Beginning in the summer of 2001, the National Weather Service (NWS), in association with the University of Delaware and Kent State University, began a test and evaluation for an Operational Heat Stress Assessment System (OHSAS). The test and evaluation generally runs from May 15 through September 30. It is believed that the results from this endeavor will ultimately improve the accuracy of recognizing and predicting environments conducive to dangerous heat conditions in an effort to reduce the likelihood of unfortunate heat related mortalities.

2. BACKGROUND

In past studies, both Laurence S. Kalkstein (from the University of Delaware) and Scott C. Sheridan (from Kent State University) reevaluated air mass classification over North America. This research was conducted through two separate studies (Kalkstein et al., 1996 and Sheridan, 2002) The classification scheme takes select parameters into consideration when designating each air mass type. The result consisted of seven different air mass types, with one consisting of further subdivisions and one a Transitional (i.e. one air mass exiting an area prior to the onset of another.) An illustration of these differing air masses can be found in Table 1. Following the development of the air mass classifiers, classification of air masses, according to their most favorable region, were further narrowed allowing for simplicity in select type and region association. For example, in Southeast Louisiana it was found that the most favorable air mass is the Moist Tropical or MT.

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Further evaluation of the MT air mass unfolded the subsets of three oppressive states. During the subset occurrences, air mass intensities were classified as M1, M2 and M1/M2 respectively. The M1 was found to be the least oppressive. Based on seasonal average, this airmass occurred approximately 13 percent of the time during peak summer months and correlating to approximately one additional daily fatality in the select region. The M2 air mass was found to be the super oppressive correlating to nearly four additional daily fatalities. Fortunately, this air mass was found to occur only 2 percent of the time during a normal summer season. The M1/ M2 was merely a transitional air mass between the M1 and the M2 and was also found to be less frequent.

3. DATA AND METHODOLOGY

As previously mentioned, the OHSAS utilizes select parameters for air mass classification. These parameters consist of ambient temperature, dew point and apparent temperature. These specific values are retrieved daily from official government observation sites located across Southeast Louisiana in particular New Orleans and Baton Rouge. For the New Orleans metropolitan area, the site is located at the Louis Armstrong International Airport in Jefferson Parish. For the Baton Rouge metropolitan area, the site is locate at the Ryan Field Airport located in East Baton Rouge Parish. In addition to these two specific OHSAS observation sites, values from the John E Lewis Field Airport located in McComb, Mississippi and values from the Gulfport/Biloxi International Airport located along the Mississippi Gulf Coast are also recorded to further help with the test and evaluation.

The OHSAS utilizes a customized website designed by Scott Sheridan for the New Orleans and Baton Rouge areas. The data for this website is derived from numerical weather prediction guidance, as well as, Area Forecast Matrices produced by the local NWS Forecast Office. Temperature and dew point values are taken from the specified OHSAS sites and applied to a working spreadsheet. Using both the predicted values of temperature and dew point from the OHSAS website, apparent temperature is then calculated. In addition to this, actual real time observations from the New Orleans and Baton Rouge observation sites are taken in order to monitor the effectiveness of the OHSAS values.

Type	Abbrev.	Description
Dry Polar	DP	Generally advected from Canada through circulation around a cold-core anticyclone and is usually associated with the lowest temperatures observed in a region for a particular time of year, as well as, clear and dry conditions.
Dry Tropical	DT	Represents the hottest and driest conditions found at any location. There are two modes of development for this air mass. It is either advected from the Southwest U.S. or Sonoran Desert of Mexico or it is produced by rapidly descending air.
Dry Moderate	DM	Air is mild and dry. Typically found in the eastern and central U.S. associated with zonal flow aloft. When it is adiabatically-warmed and located in the Southeast U.S., polar air is usually advected around a surface anticyclone with a long trajectory over the Atlantic Ocean.
Moist Polar	MP	Weather conditions are typically cloudy, humid, and cool. Air appears either by inland transport from a cool ocean or as a result of frontal overrunning well to the south of the region.
Moist Tropical	MT	Air is considerably warmer and more humid than MP. Air mass typically appears in a zone south of an MP air mass while still in an area overrunning with a responsible front much nearer.
Moist Moderate	MM	Air is warm and very humid. Found in warm sectors of frontal cyclones or in a Gulf return flow on the western side of an anticyclone in the eastern and central U.S.
Transitional	TR	Situation identified on days when one air mass gives way to another.

Table 1. *General description of redefined air mass types over North America.*

	T02	DP02	T14	DP14	AT02	AT14
MT	76	73	88	73	76	96
M1	79	76	93	75	83	105
M1/M2	--	--	--	--	86	108
M2	81	78	95	78	89	111

Table 2. *Air mass classification scheme for the New Orleans and Baton Rouge metropolitan areas where:*

T02 Forecast dry-bulb temperature for 2:00 am local time
DP02 Forecast dew-point temperature for 2:00 am local time
T14 Forecast dry-bulb temperature for 2:00 pm local time
DP14 Forecast dew-point temperature for 2:00 pm local time
AT02 Forecast apparent temperature for 2:00 am local time
AT14 Forecast apparent temperature for 2:00 pm local time

After calculations are made, the values are compared to the air mass classification scheme table which is illustrated in Table 2. Based on OHSAS guidance , the appropriate heat related product may be issued at the discretion of the forecaster.

3.1 *Policy and Definitions*

For the purpose of the test and evaluation of the OHSAS, NWS Southern Region has established the following heat-related products:

Heat Outlook - Heat stress conditions are forecast to occur beyond 48 hours, but no later than 72 hours.

Heat Watch - Heat stress conditions are forecast to occur beyond 24 hours, but no later than 48 hours.

Heat Advisory - Heat stress conditions are forecast to occur within 24 hours.

Excessive Heat Warning - Dangerous heat stress conditions are forecast to occur within 24 hours.

Based upon these definitions and subsequent air mass classification, guidelines and time tables have been established for the issuance of heat related products. This information is illustrated in Table 3.

	48 to 72 hours	24 to 48 hours	24 hours or less
MT	No Issuance	No Issuance	No Issuance
M1	Heat Outlook	Heat Watch	Heat Advisory
M2	Heat Outlook	Heat Watch	Excessive Heat Warning
M1/M2	Heat Outlook	Heat Watch	Heat Advisory / Excessive Heat Warning

Table 3. *Guidelines for the issuance of heat-related products for the Weather Forecast Office New Orleans/Baton Rouge county/parish warning area.*

4. RESULTS AND CONCLUSIONS

Thus far, the OHSAS test and evaluation has not called for a significant number of heat-related issuances. One notable exception occurred during the time period from July 17, 2002 through July 21, 2002 where high pressure at the surface and aloft had become firmly entrenched across the region. During this time period, M1 levels were able to be verified across much of the New Orleans metropolitan area. Otherwise, only sparse or isolated occurrences of M1 or M1/M2 readings have impacted the local forecast area over the past three summers. While this has been fortunate, it certainly does not diminish the dangerous effects excessive heat can bring. Likewise, additional research and testing of the OHSAS will continue across much of the region hopefully in an effort to continuously emphasis and warn for the effects of extreme heat.

5. REFERENCES

Kalkstein et al., 1996: A new spatial synoptic classification: Application to Air Mass Analysis. *Int. J. Climatology.*

Sheridan, S.C., 2002: The redevelopment of a weather-type classification scheme for North America. *Int. J. Climatology*.