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BOMB CHECKLIST AND THE 1988-89 COLD SEASON

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BOMB CHECKLIST

Routine completion of the bomb checklist at WSFO Boston will begin October 1 and continue through March 31. No major changes have been incorporated into this season's checklist (attached). Four or more checklist questions answered affirmatively will lead to coordination with WSFO Washington, D.C. and the Maritimes Weather Centre in Halifax, Nova Scotia.

VERIFICATION: 1987-88 COLD SEASON

During the 1987-88 cold season, 15 bombs were observed over the checklist forecast area. The checklist forecast 18 bombs accounting for 12 hits and 6 false alarms. The checklist missed 3 bombs. Verification resulted in a probability of detection of .80, a false alarm ratio of .33, and a critical success index of .57.

SIGNIFICANCE OF CHECKLIST QUESTIONS

For the 1987-88 cold season, percentages of affirmatively answered questions were computed for all checklists associated with forecast episodes that were scored hits. Question 1, the existence of a 17 vort max in the spawning area, was answered affirmativley 97 percent of the time. Question 3, dealing with the speed of this vort max, ranked second and was answered affirmatively 94 percent of the time. Question 4, dealing with the coastal crossing of the vort max, ranked third and was answered affirmatively 87 percent of the time. These three characteristics of upper-level vorticity appear to be the key to forecasting explosive cyclogenesis in the western North Atlantic.

The remaining three checklist questions did not rank as high. Question 5, jet streaks, ranked fourth and was answered affirmatively 77 percent of the time. Question 2, subsequent strength of the initial vort max, ranked fifth and was answered affirmatively 71 percent of the time. This infers that a strong initial vort max may, within limits, decrease in intensity and still produce a bomb. Question 6, development of a surface low 990 millibars or deeper, ranked last and was answered affirmatiavely only 61 percent of the time.

PROBLEMS AND SOLUTIONS

Dual Vorticity Maxima

A problem frequently encountered during checklist completion was the existence of dual vorticity maxima in the spawning area. In such cases, checklist completion should be accomplished by handling each vort max separately.

Merging Vorticity Maxima

Another problem often encountered was the tracking of merging vorticity maxima. In these cases, checklist completion should be accomplished by following the vort max created by the merge.

Coastal Skimmers

Last year, two misses were associated with vorticity maxima that never crossed the coast but tracked northeast parallel to the coastline. The checklist relies on the coastal crossing of vorticity maxima and fails to adequately recognize these coastal skimmers. When a checklist produces three affirmative answers coupled with an NGM forecast of a coastal skimmer, the situation should be closely monitored.

Average Vort Max Speed

To compute the average speed of a vort max through 48 hours, determine the total length of the track and divide by 48. However, if you prefer to determine the speed for each 12-hour segment, do not forget to compute an average. A speed less than threshold for one or two 12-hour segments does not necessarily produce a negative answer.

Inconsistencies in Checklist Completion

Although the checklist is an objective technique, inconsistencies are common. This is a pitfall that should be avoided. The threshold values assigned to each question were systematically chosen. For all checklist questions where a threshold value is not met, a negative answer is required. Close does not count! Subjectivity should not enter into checklist completion and is responsible, in part, for a higher than expected false alarm ratio.

FALSE ALARM RECOGNITION

During the 1985-86, 1986-87, and 1987-88 cold seasons, the false alarm ratios were .54, .48, and .33, respectively. This steady decline in the false alarm ratio is due, in part, to increased proficiency in checklist completion. However, a lower false alarm ratio is desirable. False alarm recognition is the key.

The absence of an affirmative answer for question 6, dealing with model development of a surface low over the checklist forecast area, should arouse suspicion. In almost all cases, false alarms can be recognized by the complete absence of a model-produced surface low over or near the checklist forecast area.

In defense of the checklist, 80 percent of the checklist false alarms during the past three cold seasons have coincided with gale or storm centers that did not meet meteorological bomb criteria. Overwarning is not a problem.

EXPLOSIVE CYCLOGENESIS CHECKLIST

Valid Between 38°-45° N Latitude and 55°-75° W Longitude

DATE: _____ NGM: [ ] 00Z [ ] 12Z Forecaster: _____

1. Does a 500-millibar absolute vorticity maximum of 17 x 10^{-5} s^{-1} or greater exist in the NGM initial analysis over an area bounded by 30° to 50° N latitude and 85° to 110° W longitude? VALUE: _____

   [ ] YES [ ] NO

2. Does this 500-millibar vorticity maximum maintain initial intensity or strengthen on successive 12, 24, 36, and 48 hour NGM charts?

   [ ] YES [ ] NO

3. Is this 500-millibar vorticity maximum forecast to move an average of 30 knots or greater through 48 hours?

   [ ] YES [ ] NO

4. Does the initial NGM-produced 500-millibar vorticity maximum cross the coast between 32° and 45° N latitude?

   [ ] YES [ ] NO

5. Does a jet streak of 110 knots or greater exist at 250 or 300 millibars within a 300 nautical mile radius in the semicircle south of the initial 500-millibar vorticity maximum?

   [ ] YES [ ] NO

6. Does the NGM develop a surface low of 990 millibars or deeper during the next 48 hours over an area bounded by 38° to 45° N latitude and 55° to 75° W longitude?

   [ ] YES [ ] NO

If four or more questions are answered affirmatively, the situation should be closely monitored for the possibility of explosive cyclogenesis.

Assuming a perfect prognosis of NGM-produced 500 mb vorticity, TIME ZERO (the midpoint of the 24-hour period of maximum deepening) will occur when the overtaking 500-millibar vorticity maximum is, on the average, 250 nautical miles west of the surface low.

Auciello and Sanders, September 1988