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# SUMMARY OF VERIFICATION OF NUMERICAL OPERATIONAL TROPICAL CYCLONE FORECAST TRACKS FOR 1962

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# National Oceanic and Atmospheric Administration

## U.S. Joint Numerical Weather Prediction Unit

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## 1. INTRODUCTION

The numerical forecast model employed in calculating the operational tropical cyclone forecast tracks during 1962 was for the most part the same as that employed during 1961 and described in recent papers (1, 2). The only change in the 1961 operational version of the forecast model was the inclusion in 1962 of a displacement correction which was a function of time and distance from the initial time and the initial position of the center of the tropical cyclone. This displacement correction insured that the tropical cyclone center was tracked to move more consistently with the steering wind speed, especially during the early periods of the forecast track calculation. Major alterations were made in the Automatic Data Processing and Analysis programs for the 1962 tropical cyclone season to insure that the steering wind was more accurately analyzed than was possible during the 1961 season.

## 2. FORECASTS

Tables 1, 2, 3, and 4 include all operational forecasts transmitted that could be reasonably verified. Inaccurate documentation of the position and movement of the tropical cyclone (e. g., typhoon Emma) in some instances resulted in a few exceptionally poor forecasts. On several occasions poor forecasts (e. g., Daisy, Opal) resulted because the position and movement of the new tropical

cyclone were not accurately established. For a number of the tropical cyclones, poor forecasts (e. g., Alma, Daisy, Joan) resulted because of rapid accelerations that occurred just previous to or during transition to an extra-tropical cyclone. Generally, in 1962 the typhoon forecasts were more accurate than the hurricane forecasts. There are two possible explanations; one, that Pacific typhoons move more regularly than Atlantic hurricanes and two, the sample of Atlantic hurricane forecasts is small and not statistically representative. Track forecasts were verified to the position just previous to a tropical cyclone's becoming extratropical or disappearing. Because information concerning the hurricanes off Lower California is generally poor, forecast verifications for this particular area have been grouped separately in Table 2.

## REFERENCES


1. Vanderman, L. W., 1962: An Improved NWP Model for Forecasting the Paths of Tropical Cyclones. Mon. Wea. Rev., Vol. 90, No. 1, January 1962, pp. 19-22.

2. Vanderman, L. W., 1962: Verification of Numerical Weather Prediction Operational Hurricane and Typhoon Forecasts for 1961. Technical Memorandum No. 20, Numerical Weather Prediction Group, National Meteorological Center, U. S. Weather Bureau, January 1962, 11 pages.

TABLE I

HURRICANE FORECASTS (ATLANTIC AND GULF OF MEXICO AREAS)
1962

| INITIAL POSITION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Latitude | Longitude | 12 Hours | 24 Hours | 36 Hours | 48 Hours | 60 Hours | 72 Hours |
| ALMA | | | | | | | | | |
| 8/28 | 12Z | 35.1 N | 75.5W | 102 | 155 | 29 | 177 | | |
| 8/29 | 00Z | 38.9 | 71.9 | 84 | 269 | 376 | | | |
| | 12Z | 41.2 | 68.1 | 172 | 308 | | | | |
| AVERAGE ERROR | | | | 119 | 244 | 202 | 177 | | |
| CELIA | | | | | | | | | |
| 9/13 | 00Z | 16.4 N | 49.6 W | 75 | 120 | 162 | 123 | | |
| | 12Z | 17.7 | 52.7 | 51 | 77 | 162 | 376 | | |
| 9/14 | 00Z | 18.7 | 55.6 | 82 | 124 | 257 | | | |
| | 12Z | 19.1 | 57.0 | 42 | 171 | | | | |
| 9/15 | 00Z | 20.0 | 59.0 | 75 | | | | | |
| AVERAGE ERROR | | | | 65 | 123 | 194 | 250 | | |

Errors in Nautical Miles. ( ) indicates number of forecasts averaged.

TABLE I (CONTINUED)

| INITIAL POSITION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Latitude | Longitude | 12 Hours | 24 Hours | 36 Hours | 48 Hours | 60 Hours | 72 Hours |
| DAISY | | | | | | | | | |
| 10/1 | 00Z | 17.0 N | 60.5 W | 142 | 235 | 400 | 494 | 526 | 775 |
| | 12Z | 17.8 | 61.0 | 78 | 228 | 209 | 264 | 254 | |
| 10/2 | 00Z | 19.4 | 62.5 | 117 | 107 | 204 | 198 | 277 | 359 |
| | 12Z | 22.2 | 63.0 | 128 | 186 | 323 | 430 | 538 | 592 |
| 10/3 | 00Z | 22.5 | 64.5 | 83 | 84 | 261 | | | |
| | 12Z | 23.6 | 64.9 | 63 | 93 | 45 | 113 | 233 | 496 |
| 10/4 | 00Z | 23.8 | 67.2 | 40 | 77 | 200 | 344 | 590 | 675 |
| | 12Z | 24.3 | 68.2 | 24 | 106 | | | | |
| 10/5 | 00Z | 25.2 | 69.6 | 152 | 347 | 637 | 888 | 1259 | |
| | 12Z | 26.9 | 69.7 | 34 | 196 | 286 | 542 | | |
| 10/6 | 00Z | 28.8 | 69.3 | 110 | 156 | 329 | | | |
| | 12Z | 32.8 | 68.1 | 34 | 130 | | | | |
| 10/7 | 00Z | 36.0 | 67.0 | 114 | | | | | |
| | 12Z | 42.0 | 66.4 | | | | | | |
| AVERAGE ERROR | | | | 86 | 162 | 289 | 409 | 525 | 579 |

TABLE I (CONTINUED)

INITIAL POSITION

| Date | Time | Latitude | Longitude | 12 Hours | 24 Hours | 36 Hours | 48 Hours | 60 Hours | 72 Hours |
|---|---|---|---|---|---|---|---|---|---|
| ELLA | | | | | | | | | |
| 10/16 | 12Z | 26.4 N | 73.7 W | 32 | 16 | 65 | 36 | 36 | 20 |
| 10/17 | 00Z | 26.5 | 74.9 | 25 | 12 | 62 | 117 | 222 | 304 |
| | 12Z | 27.5 | 75.8 | 60 | 48 | 111 | 185 | 288 | 426 |
| 10/18 | 00Z | 29.4 | 75.7 | 109 | 181 | 310 | 378 | 397 | 459 |
| | 12Z | 29.8 | 76.0 | 19 | 109 | 145 | 168 | 162 | 216 |
| 10/19 | 00Z | 31.1 | 76.2 | 106 | 220 | 341 | 412 | 535 | 625 |
| | 12Z | 30.7 | 74.5 | 71 | 186 | 262 | 419 | 569 | |
| 10/20 | 00Z | 31.8 | 72.7 | 39 | 40 | 117 | 186 | | |
| | 12Z | 33.8 | 70.6 | 46 | 102 | 267 | | | |
| 10/21 | 00Z | 35.1 | 68.7 | 99 | 160 | | | | |
| | 12Z | 36.7 | 64.6 | 68 | | | | | |
| 10/22 | 00Z | 39.2 | 60.7 | | | | | | |
| AVERAGE ERROR | | | | 61 | 107 | 187 | 238 | 316 | 342 |
| AVERAGE ERROR FOR ALL FORECASTS | | | | (32) 77 | (29)146 | (24)232 | (19)308 | (14)420 | (11)450 |

TABLE II

HURRICANE FORECASTS (LOWER CALIFORNIA) - 1962

| INITIAL POSITION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Latitude | Longitude | 12 Hours | 24 Hours | 36 Hours | 48 Hours | 60 Hours | 72 Hours |
| CLAUDIA | | | | | | | | | |
| 9/21 | 00Z | 20.5 N | 110.0 W | 39 | 106 | 207 | 330 | | |
| | 12Z | 21.8 | 110.7 | 102 | 145 | 222 | 223 | 292 | |
| 9/22 | 00Z | 24.0 | 112.2 | 13 | 19 | 48 | 123 | | |
| AVERAGE ERROR | | | | 51 | 90 | 159 | 225 | 292 | |
| DOREEN | | | | | | | | | |
| 10/4 | 00Z | 21.2 N | 108.8 W | 106 | | | | | |
| AVERAGE ERROR FOR ALL FORECASTS | | | | (4) 65 | (3) 90 | (3) 159 | (3) 225 | (1) 292 | |

Errors in nautical miles. ( ) indicates number of forecasts averaged.

TABLE III

TYPHOON FORECASTS (WESTERN AND CENTRAL PACIFIC)
1962

| INITIAL POSITION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Latitude | Longitude | 12 Hours | 24 Hours | 36 Hours | 48 Hours | 60 Hours | 72 Hours |
| JOAN | | | | | | | | | |
| 7/9 | 00Z | 24.9 N | 127.3 E | 55 | 124 | 225 | 500 | | |
| | 12Z | 27.8 | 125.6 | 40 | 75 | 216 | | | |
| 7/10 | 12Z | 34.9 | 124.8 | 246 | | | | | |
| AVERAGE ERROR | | | | 114 | 100 | 220 | 500 | | |
| KATE | | | | | | | | | |
| 7/23 | 12Z | 28.0 | 121.5 E | 54 | 49 | 55 | 163 | | |
| LOUISE | | | | | | | | | |
| 7/23 | 00Z | 27.4 N | 152.1 E | 16 | 73 | 62 | 84 | 165 | 250 |
| | 12Z | 27.6 | 149.6 | 59 | 73 | 37 | 5 | 71 | 108 |
| 7/26 | 00Z | 30.7 | 137.1 | 54 | 77 | 171 | 356 | | |
| 7/27 | 00Z | 32.6 | 135.3 | 54 | 107 | 206 | | | |
| AVERAGE ERROR | | | | 46 | 82 | 119 | 148 | 118 | 179 |

Errors in nautical miles. ( ) indicates number of forecast averaged.

TABLE III (CONTINUED)

INITIAL POSITION

NORA

| Date | Time | Latitude | Longitude | 12 Hours | 24 Hours | 36 Hours | 48 Hours | 60 Hours | 72 Hours |
|---|---|---|---|---|---|---|---|---|---|
| 7/31 | 00Z | 24.0 N | 127.4 E | 85 | 93 | 211 | 286 | 433 | 687 |
| | 12Z | 25.2 | 126.7 | 42 | 105 | 140 | 217 | 403 | 665 |
| 8/1 | 00Z | 26.8 | 125.3 | 151 | 228 | 322 | 529 | 884 | |
| | 12Z | 30.3 | 124.7 | 51 | 93 | 68 | 195 | | |
| 8/2 | 00Z | 32.8 | 124.1 | 63 | 214 | 458 | | | |
| | 12Z | 35.8 | 124.3 | 210 | 519 | | | | |
| AVERAGE ERROR | | | | 100 | 209 | 240 | 307 | 573 | 676 |

OPEL

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 8/2 | 12Z | 12.5 N | 137.6 E | 168 | 192 | 329 | 394 | 333 | 380 |
| 8/3 | 00Z | 15.4 | 134.5 | 36 | 66 | 141 | 225 | 310 | 406 |
| | 12Z | 17.4 | 131.7 | 26 | 30 | 66 | 233 | 469 | |
| 8/4 | 00Z | 19.0 | 128.8 | 23 | 92 | 278 | 373 | | |
| | 12Z | 20.3 | 126.1 | 22 | 84 | 138 | 210 | | |
| 8/5 | 00Z | 21.3 | 123.9 | 51 | 184 | 340 | | | |
| | 12Z | 23.4 | 122.4 | 21 | 62 | | | | |
| 8/6 | 00Z | 25.3 | 120.1 | | | | | | |
| AVERAGE ERROR | | | | 50 | 101 | 215 | 287 | 371 | 393 |

TABLE III (CONTINUED)

| INITIAL POSITION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Latitude | Longitude | 12 Hours | 24 Hours | 36 Hours | 48 Hours | 60 Hours | 72 Hours |
| PATSY | | | | | | | | | |
| 8/9 | 12Z | 15.6 N | 114.7 E | 12 | 98 | 106 | | | |
| 8/10 | 00Z | 16.9 | 111.8 | 175 | 302 | | | | |
| AVERAGE ERROR | | | | 94 | 200 | 106 | | | |
| RUTH | | | | | | | | | |
| 8/16 | 00Z | 21.4 N | 145.4 E | 50 | 154 | 292 | 455 | 505 | 533 |
| 8/17 | 12Z | 28.4 | 142.6 | 42 | 216 | 354 | 513 | 626 | 503 |
| 8/20 | 00Z | 33.7 | 141.0 | 67 | 132 | 228 | 301 | 382 | |
| | 12Z | 35.3 | 142.2 | 37 | 30 | 73 | 181 | | |
| 8/21 | 12Z | 38.1 | 146.3 | 26 | 13 | | | | |
| 8/22 | 00Z | 39.3 | 150.0 | 62 | | | | | |
| AVERAGE ERROR | | | | 47 | 109 | 237 | 362 | 504 | 518 |

TABLE III (CONTINUED)

INITIAL POSITION

| Date | Time | Latitude | Longitude | 12 Hours | 24 Hours | 36 Hours | 48 Hours | 60 Hours | 72 Hours |
|---|---|---|---|---|---|---|---|---|---|
| **SARAH** | | | | | | | | | |
| 8/15 | 12Z | 23.7 N | 126.4 E | 33 | 39 | 111 | 207 | 408 | 466 |
| 8/17 | 12Z | 23.5 | 124.7 | 37 | 125 | 193 | 286 | 251 | 271 |
| 8/18 | 12Z | 23.8 | 125.7 | 63 | 106 | 164 | 203 | 289 | |
| 8/19 | 12Z | 27.8 | 126.0 | 33 | 95 | 157 | 204 | | |
| 8/20 | 00Z | 29.8 | 126.5 | 113 | 206 | 236 | 228 | | |
| | 12Z | 30.4 | 127.4 | 64 | 101 | 139 | | | |
| 8/21 | 00Z | 31.0 | 128.7 | 21 | 52 | | | | |
| | 12Z | 32.1 | 130.4 | 28 | | | | | |
| AVERAGE ERROR | | | | 49 | 103 | 167 | 226 | 316 | 368 |
| **THELMA** | | | | | | | | | |
| 8/21 | 12Z | 19.7 N | 145.5 E | 18 | 64 | 72 | | | |
| 8/22 | 00Z | 21.3 | 143.9 | 22 | 12 | 28 | 44 | 65 | 130 |
| | 12Z | 22.9 | 141.7 | 31 | 87 | 164 | 286 | | |
| 8/23 | 00Z | 24.3 | 140.1 | 42 | 123 | 163 | 356 | 292 | 426 |
| 8/24 | 00Z | 26.7 | 137.0 | 19 | 55 | 113 | 237 | 340 | 418 |
| | 12Z | 28.3 | 137.0 | 0 | 43 | 155 | 237 | 288 | |
| 8/25 | 00Z | 29.9 | 136.7 | 83 | 214 | 348 | 416 | | |
| | 12Z | 32.4 | 136.8 | 126 | 175 | 164 | | | |
| AVERAGE ERROR | | | | 43 | 97 | 151 | 263 | 246 | 325 |

TABLE III (CONTINUED)

| INITIAL POSITION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Latitude | Longitude | 12 Hours | 24 Hours | 36 Hours | 48 Hours | 60 Hours | 72 Hours |
| VERA | | | | | | | | | |
| 8/26 | 12Z | 24.8 N | 133.1 E | 69 | 124 | 108 | | | |
| 8/27 | 00Z | 27.3 | 132.0 | 19 | 96 | | | | |
| | 12Z | 29.7 | 131.1 | 49 | | | | | |
| AVERAGE ERROR | | | | 46 | 110 | 108 | | | |
| WANDA | | | | | | | | | |
| 8/30 | 00Z | 18.7 N | 124.8 | 96 | 136 | 157 | 190 | 155 | 164 |
| | 12Z | 19.5 | 121.1 | 59 | 125 | 265 | | | |
| AVERAGE ERROR | | | | 78 | 130 | 211 | 190 | 155 | 164 |



124 857

TABLE III (CONTINUED)

INITIAL POSITION

| Date | Time | Latitude | Longitude | 12 Hours | 24 Hours | 36 Hours | 48 Hours | 60 Hours | 72 Hours |
|---|---|---|---|---|---|---|---|---|---|
| **AMY** | | | | | | | | | |
| 8/30 | 12Z | 17.6 N | 145.9 E | 149 | 260 | 300 | 290 | 275 | 200 |
| 8/31 | 12Z | 19.9 | 137.5 | 62 | 182 | 334 | 567 | 801 | 886 |
| 9/1 | 12Z | 19.2 | 132.3 | 73 | 167 | 271 | 349 | 382 | 500 |
| 9/2 | 00Z | 18.7 | 130.1 | 90 | 169 | 232 | 251 | 382 | 395 |
| | 12Z | 18.7 | 129.3 | 18 | 62 | 146 | 101 | 83 | 90 |
| 9/3 | 00Z | 18.9 | 128.4 | 31 | 121 | 96 | 105 | 117 | 86 |
| | 12Z | 19.7 | 127.3 | 46 | 12 | 84 | | | |
| 9/4 | 00Z | 21.0 | 125.2 | 99 | 154 | 230 | | | |
| | 12Z | 21.6 | 124.6 | 106 | 167 | 172 | | | |
| 9/5 | 00Z | 23.8 | 122.5 | 42 | 56 | 223 | 491 | 682 | 975 |
| | 12Z | 25.0 | 120.0 | 73 | 176 | 419 | 620 | 1020 | 1171 |
| 9/7 | 12Z | 35.6 | 122.6 | 127 | 117 | | | | |
| AVERAGE ERROR | | | | 76 | 137 | 228 | 347 | 468 | 538 |
| **DINAH** | | | | | | | | | |
| 9/30 | 00Z | 19.4 N | 137.2 E | 90 | 195 | 321 | 401 | 431 | 493 |
| | 12Z | 20.5 | 134.8 | 73 | 104 | 120 | 114 | 121 | 430 |
| 10/1 | 00Z | 20.9 | 131.9 | 34 | 41 | 43 | 98 | 176 | 308 |
| | 12Z | 21.0 | 128.5 | 60 | 86 | 104 | 126 | 192 | |
| 10/2 | 00Z | 20.7 | 125.7 | 21 | 41 | 29 | 90 | | |
| | 12Z | 21.1 | 123.0 | 115 | 162 | 229 | | | |
| AVERAGE ERROR | | | | 66 | 105 | 141 | 166 | 230 | 410 |

TABLE III (CONTINUED)

| INITIAL POSITION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Latitude | Longitude | 12 Hours | 24 Hours | 36 Hours | 48 Hours | 60 Hours | 72 Hours |
| **EMMA** | | | | | | | | | |
| 10/3 | 00Z | 16.1 N | 146.9 E | 128 | 230 | 389 | | | |
| 10/4 | 00Z | 18.8 | 146.4 | 51 | 36 | 89 | 177 | 269 | 466 |
| | 12Z | 20.4 | 145.8 | 108 | 209 | | | | |
| 10/5 | 00Z | 21.9 | 144.9 | 102 | 222 | 346 | 599 | 829 | 1090 |
| | 12Z | 24.9 | 143.4 | 290 | 397 | 523 | 822 | 953 | 1161 |
| 10/6 | 12Z | 23.6 | 145.0 | 133 | 239 | 335 | 414 | 510 | 546 |
| 10/7 | 12Z | 25.3 | 149.8 | 231 | 322 | 447 | 470 | 422 | 320 |
| 10/8 | 00Z | 23.9 | 149.3 | 36 | 49 | 117 | 206 | 313 | 414 |
| | 12Z | 24.1 | 151.0 | 97 | 124 | 156 | 223 | 316 | 448 |
| 10/9 | 00Z | 23.7 | 152.4 | 33 | 121 | 249 | 384 | 560 | |
| 10/10 | 00Z | 27.3 | 157.2 | 72 | 146 | 156 | | | |
| | 12Z | 31.1 | 159.8 | 46 | 33 | | | | |
| 10/11 | 00Z | 35.1 | 162.9 | 75 | | | | | |
| AVERAGE ERROR | | | | 108 | 177 | 281 | 412 | 522 | 635 |
| **FREDA** | | | | | | | | | |
| 10/5 | 00Z | 23.1 N | 163.8 E | 19 | 61 | 130 | 192 | 254 | |
| 10/7 | 00Z | 25.7 | 163.3 | 37 | 72 | 63 | 200 | 351 | |
| | 12Z | 27.3 | 163.8 | 64 | 110 | 62 | 31 | | |
| 10/8 | 00Z | 28.4 | 163.7 | 49 | 129 | | | | |
| | 12Z | 29.4 | 164.4 | 158 | 247 | | | | |
| 10/9 | 00Z | 32.9 | 167.2 | 59 | | | | | |
| AVERAGE ERROR | | | | 64 | 124 | 85 | 141 | 302 | |

TABLE III (CONTINUED)

| INITIAL POSITION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Latitude | Longitude | 12 Hours | 24 Hours | 36 Hours | 48 Hours | 60 Hours | 72 Hours |
| GILDA | | | | | | | | | |
| 10/22 | 12Z | 15.5 N | 132.0 E | 93 | 162 | 244 | 206 | 253 | 312 |
| 10/23 | 12Z | 15.5 | 132.4 | 63 | 79 | 149 | 241 | 250 | 254 |
| 10/24 | 00Z | 15.5 | 132.5 | 140 | 221 | 355 | 434 | 500 | 536 |
| | 12Z | 16.0 | 130.0 | 117 | 278 | 354 | 412 | 459 | 468 |
| 10/25 | 00Z | 16.0 | 128.5 | 184 | 275 | 328 | 349 | 329 | 298 |
| | 12Z | 15.8 | 126.5 | 25 | 79 | 148 | | | |
| 10/26 | 00Z | 16.6 | 125.4 | 20 | 109 | 160 | 219 | 286 | 364 |
| 10/27 | 00Z | 17.8 | 125.3 | 80 | 178 | 271 | 356 | 484 | 596 |
| | 12Z | 18.7 | 126.6 | 40 | 80 | 96 | 186 | 328 | |
| 10/29 | 12Z | 24.9 | 135.3 | 68 | | | | | |
| AVERAGE ERROR | | | | 83 | 162 | 234 | 300 | 361 | 404 |
| AVERAGE ERROR FOR ALL FORECASTS | | | | (97)72 | (90)133 | (79)200 | (62)288 | (49)388 | (39)467 |

## TABLE IV

### HURRICANE (ATLANTIC AND GULF OF MEXICO AREAS) FORECASTS

1956 thru 1962

| YEAR | 12 HOURS | 24 HOURS | 36 HOURS | 48 HOURS | 72 HOURS |
|---|---|---|---|---|---|
| 1956 | -------- | (15) 107 | (1) 100 | (10) 229 | (4) 300 |
| 1957 | (9) 51 | (10) 79 | (7) 146 | (6) 241 | (3) 510 |
| 1958 | (59) 102 | (48) 194 | (50) 294 | (44) 357 | (32) 595 |
| 1959 | (40) 68 | (38) 129 | (36) 191 | (29) 257 | (19) 361 |
| 1960 | (19) 70 | (19) 142 | (19) 242 | (13) 318 | (5) 450 |
| 1961 | (88) 74 | (84) 148 | (74) 228 | (34) 317 | (22) 530 |
| 1962 | (32) 77 | (29) 146 | (24) 232 | (19) 308 | (11) 450 |

Average errors in nautical miles by forecast periods. (  ) indicates number of forecasts averaged.