

Scenario:

7 different GRIB sources (no tide GRIBS)

Race: Trans Atlantic (Newport, Rhode Island – Lizard Light, England)

| GRIB Source | Cost (3 hr time step) |
|--------------|-----------------------|
| GFS | \$1011.32 |
| EC | \$ 1,079.6 |
| GEM | \$509.94 |
| GRIB | \$1009.76 |
| WW3 | \$180.31 |
| NAM (CONUS) | \$888.94 |
| COAMPS | \$21.95 |
| TOTAL | \$4,701.82 |

| GRIB Source | Cost (default time step) |
|--------------|--------------------------|
| GFS | \$572.27 |
| EC | \$ 1,079.6 (same) |
| GEM | \$509.94 (same) |
| GRIB | \$503.04 |
| WW3 | \$104.74 |
| NAM (CONUS) | \$888.94 (same) |
| COAMPS | \$21.95 (same) |
| TOTAL | \$3,680.48 |

Summary: The analysis provided is of a reasonable and expected amount of different GRIB sources a team would download for the Trans-Atlantic race. The resolution and time steps combinations are many; however those presented herein encompass a predictable subscription and GRIB resolutions. This study was conducted to demonstrate the overall exact cost of downloading GRIBS at sea via an INMARSAT Fleet 250.

The product Model Accuracy aids not only in the performance side of sailing proving which GRIB source is the most accurate and why; but also which GRIBs the navigator should focus their attention and budget on downloading more of an in a higher resolution.

A very real scenario could be to begin such race downloading all the above GRIBS, then identify which are performing the best and stop downloading the worst performers. Then with that money saved the subscription could be changed to request a higher resolution of the GEM or EC model if those GRIBS are outperforming the others. In such a case the end result is better and more confident optimal routes based of a higher resolution GRIB which is in fact the most accurate and savings of team money after they stop downloading poor performing GRIBS. Performance is enhanced and money is saved.

In the case of organized races such as the VOR where money is not the factor but instead the download file size allowance set forth by the race organization, the sailors can immediately realize which GRIBS are performing and not performing and stop downloading the poor performers and increase the resolution on the top performing GRIBS all while staying in the file size allowance.

| GRIB Area Corner Points (full Race Course) *6 days | |
|--|--|
| NW Point: 55N – 075W | NE Point: 55N – 00W/E (Prime Meridian) |
| SW Point: 40N – 075W | SE Point: 40N – 00W/E (Prime Meridian) |

| GRIB Area Corner Points (2 nd half Race Course) *6 days | |
|--|--|
| NW Point: 60N – 037.5W | NE Point: 60N – 00W/E (Prime Meridian) |
| SW Point: 45N – 037.5W | SE Point: 45N – 00W/E (Prime Meridian) |

INMARSAT Satellite billing schedule:

\$230.47 USD per month for 10MB data *with \$22.97 USD per each 1MB over 10MB monthly allowance

GFS

| Description of GRIB Request (Full Race Course) | Size per GRIB | Total Size of all GFS GRIBS for 1 st half of race | | Total Cost |
|--|------------------|---|------------|--|
| 3hr forecast/12 days/0.5 resolution (highest)/with compression feature PARAMETERS: PRMSL & WIND | = 1,333 kb | x 4 times a day x 6 days | = 31.99 MB | 10 MB = \$230.47 21.99MB @ \$22.97 per MB = \$505.11 TOTAL = \$735.58 |
| Default forecast /12 days/0.5 resolution (highest)/with compression feature PARAMETERS: PRMSL & WIND | = 720 kb | x 4 times a day x 6 days | = 17.28 MB | 10 MB = \$230.47 7.28 MB @ \$22.97 per MB = \$167.22 TOTAL: \$397.69 |

*default forecast is every 3 hrs for 48 hrs, then every 6 hrs until 120 hrs, then every 12 hrs until 192 hrs, then every 24 hrs until the 12th day.

GFS

| Description of GRIB Request (2 nd half of Race Course) | Size per GRIB | Total Size of all GFS GRIBS for 1 st half of race | | Total Cost |
|---|------------------|---|-----------|--|
| 3hr forecast/6 days/0.5 resolution (highest)/with compression feature | = 501 kb | x 4 times a day x 6 days | = 12.0 MB | 10 MB/month already used 12.0 MB @ \$22.97 per MB = \$275.74 |
| Default forecast /6 days/0.5 resolution (highest)/with compression feature | = 318 kb | x 4 times a day x 6 days | = 7.6 MB | 10 MB/month already used 7.6 MB @ \$22.97 per MB = \$174.57 |

GFS Total Race Cost

| Forecast | 1 st half of race | 2 nd half of race | Total cost for race |
|------------------------|------------------------------|------------------------------|---------------------|
| GFS total cost 3 hr | \$735.58 | \$275.74 | \$1011.32 |
| GFS total cost default | \$397.69 | \$174.58 | \$572.27 |

EC

| Description of GRIB Request (Full Race Course) | Size per GRIB | Total Size of all CEPHIRLM GRIBS for 1 st half of race | | Total Cost |
|---|------------------|--|-----------|--|
| 3hr forecast/10 days/0.5 degree resolution/with compression feature PARAMETERS: PMSL & WIND | = 1,500 kb | x 4 times a day x 6 days | = 36.0 MB | 10 MB/month already used MB @ \$22.97 per MB = \$ 826.92 |

EC

| Description of GRIB Request (2 nd half of Race Course) | Size per GRIB | Total Size of all CEPHIRLM GRIBS for 1 st half of race | | Total Cost |
|---|------------------|--|-----------|--|
| 3hr forecast/6 days/0.5 degree resolution /with compression feature PARAMETERS: PMSL & WIND | = 459.2 kb | x 4 times a day x 6 days | = 11.0 MB | 10 MB/month already used MB @ \$22.97 per MB = \$ 252.67 |

EC Total Race Cost

| Forecast | 1 st half of race | 2 nd half of race | Total cost for race |
|--------------------|------------------------------|------------------------------|---------------------|
| EC total cost 3 hr | \$ 826.92 | \$ 252.67 | \$ 1,079.6 |

GEM

| Description of GRIB Request (Full Race Course) | Size per GRIB | Total Size of all GEM GRIBS for 1 st half of race | | Total Cost |
|---|------------------|---|-----------|--|
| 3hr forecast/6 days/0.6 resolution/with compression feature PARAMETERS: PMSL & WIND | = 593.3 kb | x 4 times a day x 6 days | = 14.2 MB | 10 MB/month already used MB @ \$22.97 per MB = \$ 339.96 |

GEM

| Description of GRIB Request (2 nd half of Race Course) | Size per GRIB | Total Size of all GEM GRIBS for 1 st half of race | | Total Cost |
|---|------------------|---|----------|--|
| 3hr forecast/6 days/0.6 resolution/with compression feature PARAMETERS: PMSL & WIND | = 308.4 kb | x 4 times a day x 6 days | = 7.4 MB | 10 MB/month already used MB @ \$22.97 per MB = \$ 169.98 |

GEM Total Race Cost

| Forecast | 1 st half of race | 2 nd half of race | Total cost for race |
|---------------------|------------------------------|------------------------------|---------------------|
| GEM total cost 3 hr | \$339.96 | \$ 169.98 | \$ 509.94 |

GRIB

| Description of GRIB Request (Full Race Course) | Size per GRIB | Total Size of all GFS GRIBS for 1 st half of race | | Total Cost |
|--|------------------|---|------------|---|
| 3hr forecast/12 days/0.5 resolution (highest)/with compression feature PARAMETERS: PRMSL & WIND | =1,332 kb | x 4 times a day x 6 days | = 32.96 MB | 10 MB/month already used 32.96 MB @ \$22.97 per MB = \$757.09 |
| Default forecast /12 days/0.5 resolution (highest)/with compression feature PARAMETERS: PRMSL & WIND | = 637 kb | x 4 times a day x 6 days | = 15.28 MB | 10 MB/month already used 15.28 MB @ \$22.97 per MB = \$350.98 |

GRIB

| Description of GRIB Request (2 nd half of Race Course) | Size per GRIB | Total Size of all GFS GRIBS for 1 st half of race | | Total Cost |
|---|------------------|---|-----------|--|
| 3hr forecast/6 days/0.5 resolution (highest)/with compression feature PARAMETERS: PRMSL & WIND | = 459 kb | x 4 times a day x 6 days | = 11.0 MB | 10 MB/month already used 11.0 MB @ \$22.97 per MB = \$252.67 |
| Default forecast /6 days/0.5 resolution (highest)/with compression feature PARAMETERS: PRMSL & WIND | = 276 kb | x 4 times a day x 6 days | = 6.62 MB | 10 MB/month already used 6.62 MB @ \$22.97 per MB = \$152.06 |

GRIB Total Race Cost

| Forecast | 1 st half of race | 2 nd half of race | Total cost for race |
|------------------------|------------------------------|------------------------------|---------------------|
| GFS total cost 3 hr | \$757.09 | \$252.67 | \$1009.76 |
| GFS total cost default | \$350.98 | \$152.06 | \$503.04 |

WW3

| Description of GRIB Request (Full Race Course) | Size per GRIB | Total Size of all GFS GRIBS for 1 st half of race | | Total Cost |
|--|------------------|---|-----------|---|
| 3hr forecast/7 days/1.0 resolution (highest)/with compression feature PARAMETERS: WAVES & WIND | = 205 kb | x 4 times a day x 6 days | = 4.92 MB | 10 MB/month already used 4.92 MB @ \$22.97 per MB = \$ 113.01 |
| Default forecast/7 days/1.0 resolution (highest)/with compression feature PARAMETERS: WAVES & WIND | = 119 kb | x 4 times a day x 6 days | = 2.86 MB | 10 MB/month already used 2.86 MB @ \$22.97 per MB = \$ 65.69 |

WW3

| Description of GRIB Request (2 nd half of Race Course) | Size per GRIB | Total Size of all GFS GRIBS for 1 st half of race | | Total Cost |
|--|------------------|---|-----------|---|
| 3hr forecast/7 days/1.0 resolution (highest)/with compression feature PARAMETERS: WAVES & WIND | = 122 kb | x 4 times a day x 6 days | = 2.93 MB | 10 MB/month already used 2.93 MB @ \$22.97 per MB = \$ 67.3 |
| Default forecast/7 days/1.0 resolution (highest)/with compression feature PARAMETERS: WAVES & WIND | = 71 kb | x 4 times a day x 6 days | = 1.7 MB | 10 MB/month already used MB @ \$22.97 per MB = \$ 39.05 |

WW3 Total Race Cost

| Forecast | 1 st half of race | 2 nd half of race | Total cost for race |
|------------------------|------------------------------|------------------------------|---------------------|
| WW3 total cost 3 hr | \$113.01 | \$67.3 | \$180.31 |
| WW3 total cost default | \$65.69 | \$39.05 | \$104.74 |

NAM CONUS

| Description of GRIB Request (CONUS) | Size per GRIB | Total Size of all GFS GRIBS for 1 st half of race | | Total Cost |
|---|------------------|---|-----------|---|
| 3hr forecast/3 days/resolution not available/ PARAMETERS: MSLP & WIND | = 3,229 kb | x 4 times a day x 3 days | = 38.7 MB | 10 MB/month already used 38.7 MB @ \$22.97 per MB = \$ 888.94 |

NAM CONUS GRIB Area Corner Points * first 3 days of racing

| | |
|----------------------|---------------------|
| NW Point: 55N – 075W | NE Point: 55N – 50W |
| SW Point: 40N – 075W | SE Point: 40N – 50W |

| COAMPS (only available in Continental USA for START) | | | | |
|---|---------------|--|----------|--|
| Description of GRIB Request (Area that COAMPS is available for START) | Size per GRIB | Total Size of all GFS GRIBS for 1 st half of race | | Total Cost |
| Default forecast/3 days/0.5 resolution (highest)/with compression feature PARAMETERS:MSLP & PRMSL & WIND | = 53 kb | x 4 times a day x 3 days | = 636 kb | <i>10 MB/month already used</i> 0.636 MB @ \$22.97 per MB = \$14.6 |
| COAMPS (only available in Western Europe for FINISH) | | | | |
| Description of GRIB Request (Area that COAMPS is available for FINISH) | Size per GRIB | Total Size of all GFS GRIBS for 1 st half of race | | Total Cost |
| Default forecast/2 days/0.5 resolution (highest)/with compression feature PARAMETERS:MSLP & PRMSL & WIND | = 40 kb | x 4 times a day x 2 days | = 320 kb | <i>10 MB/month already used</i> 0.32 MB @ \$22.97 per MB = \$7.35 |

| COAMPS Total Race Cost | | | |
|-------------------------------|------------------------------|------------------------------|---------|
| Forecast | 1 st half of race | 2 nd half of race | Total |
| COAMPS total cost | \$14.6 | \$7.35 | \$21.95 |

| COAMPS GRIB Area Corner Points (only available in Continental USA for START) | |
|--|--------------------------------------|
| NW Point: 55N – 75W | NE Point: 55N – 45W (Prime Meridian) |
| SW Point: 40N – 75W | SE Point: 40N – 45W (Prime Meridian) |
| COAMPS GRIB Area Corner Points (only available in Western Europe for FINISH) | |
| NW Point: 60N – 15W | NE Point: 60N – 0W (Prime Meridian) |
| SW Point: 45N – 15W | SE Point: 45N – 0W (Prime Meridian) |