Global Wind Hazard Preview

TAOS^{tm} Real Time Operations System
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Abstract

TAOS^{tm} WX Global Analysis of wind hazards and economic impact estimates based the 20240501000000 00z forecast. This analysis was run using proc:gfs TAOS Version 25.01:ROCKY9:GCC11:2024:106:1435, and includes wind hazards from tropical cyclones, winter storms, mid latitude cyclones, and other synoptic scale weather systems.

Report generated Wed May 1 07:38:30 AM UTC 2024 on cortex2 using GFS data downloaded on Wed May 1 03:32:11 AM UTC 2024.

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Chapter 1

Forecast Day 1: 2024-05-01

Table 1.1: Global Economic Impacts for day 1

scenario	exposures	economic_impact
f001_20240501	294905	3.71 Million USD

Table 1.2: Countries with over 100 thousand USD in impacts

name	num_exposures	economic_impact
Argentina	92549	.63 Million USD
China	114906	.38 Million USD
Russia	10007	.13 Million USD
Saudi Arabia	49266	2.04 Million USD
Spain	955	.20 Million USD
United Arab Emirates	6595	.13 Million USD
United States	7010	.13 Million USD

(7 rows)
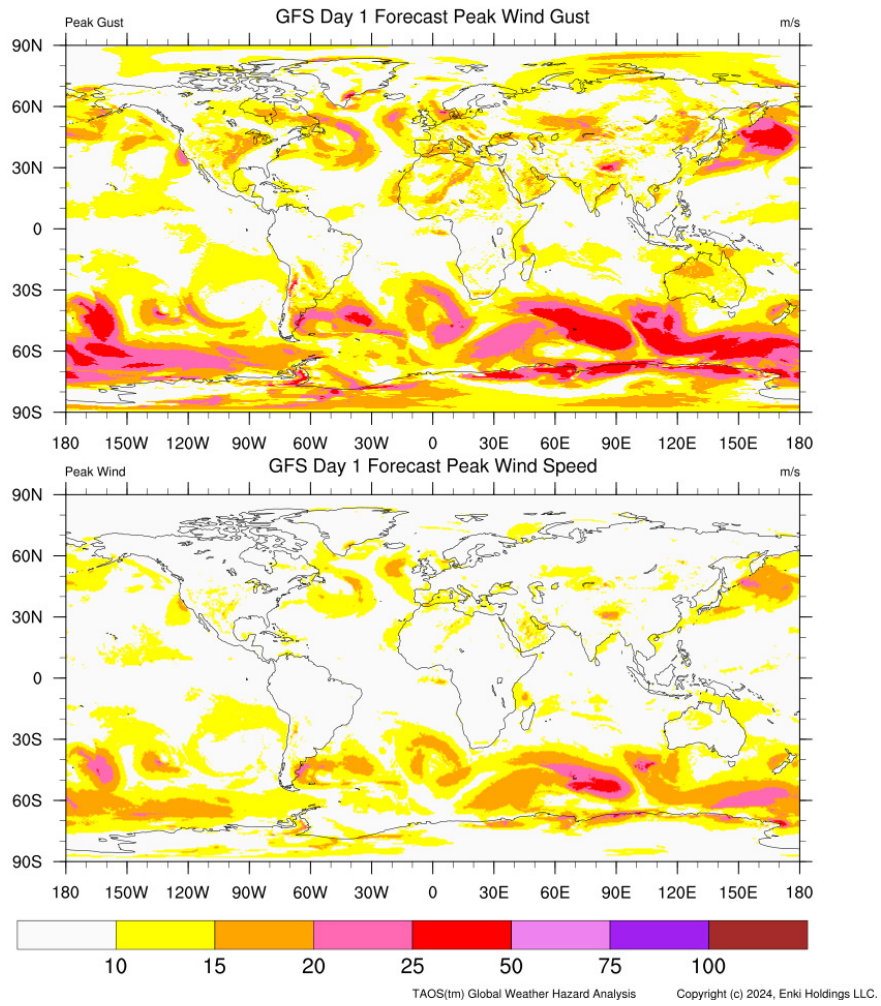
Figure 1.1: GFS Wind Forecast for day 1

Chapter 2

Forecast Day 2: 2024-05-02

Table 2.1: Global Economic Impacts for day 2

scenario	exposures	economic_impact
f002_20240501	83721	7.33 Million USD

Table 2.2: Countries with over 100 thousand USD in impacts

name	num_exposures	economic_impact
Bangladesh	4409	6.81 Million USD
Iran	23395	.13 Million USD
United States	19682	.14 Million USD

(3 rows)
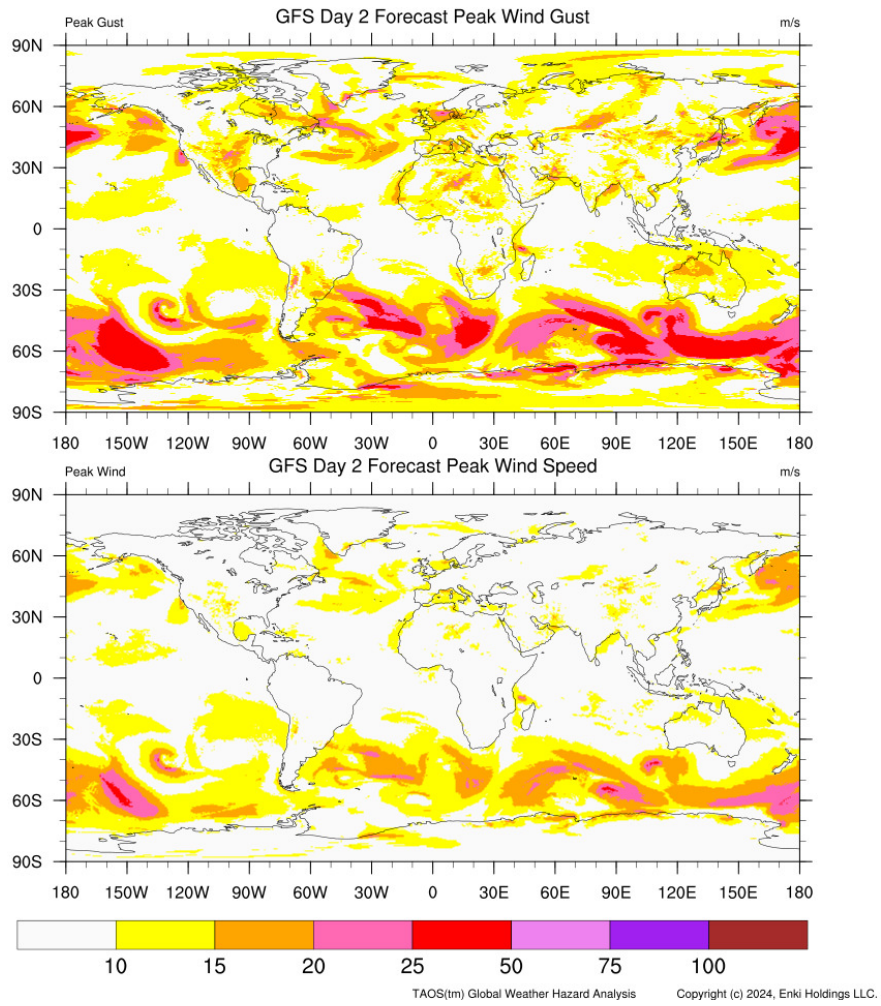
Figure 2.1: GFS Wind Forecast for day 2

Chapter 3

Forecast Day 3: 2024-05-03

Table 3.1: Global Economic Impacts for day 3

scenario	exposures	economic_impact
f003_20240501	208767	3.27 Million USD

Table 3.2: Countries with over 100 thousand USD in impacts

name	num_exposures	economic_impact
Algeria	4512	.23 Million USD
Argentina	81661	1.15 Million USD
Libya	67492	1.11 Million USD
Mexico	1911	.24 Million USD
Syria	12000	.17 Million USD

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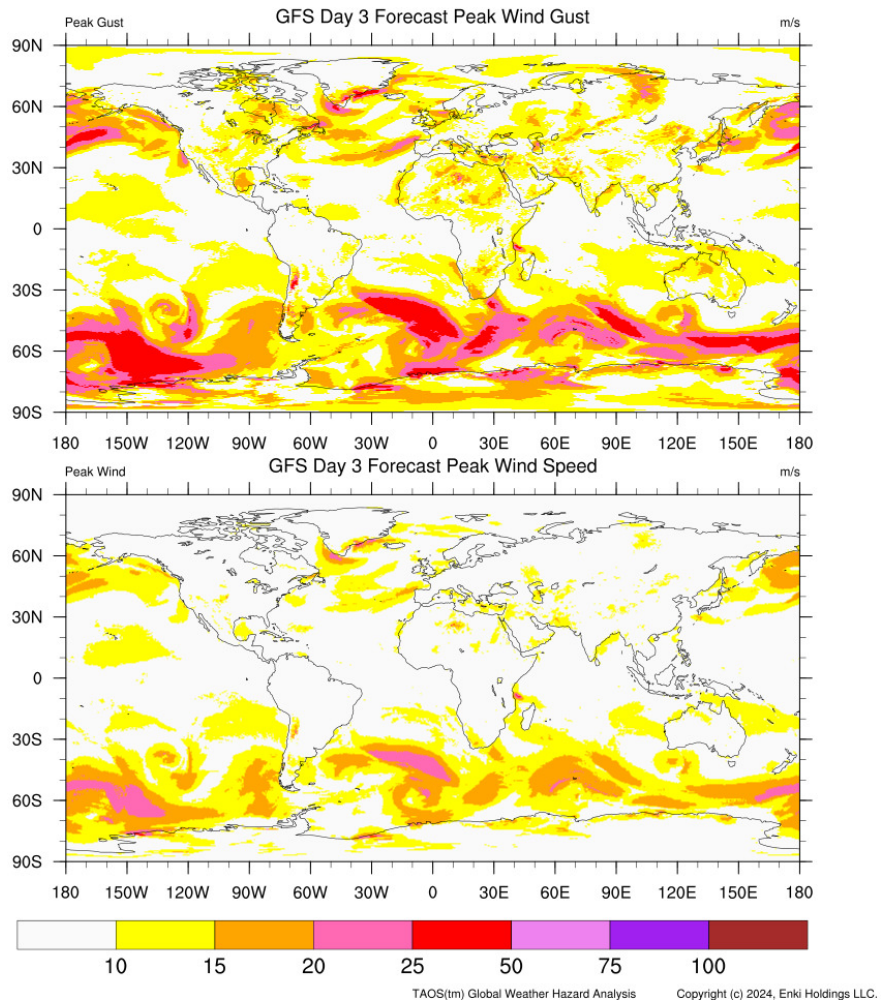
Figure 3.1: GFS Wind Forecast for day 3

Chapter 4

Forecast Day 4: 2024-05-04

Table 4.1: Global Economic Impacts for day 4

scenario	exposures	economic_impact
f004_20240501	243186	5.53 Million USD

Table 4.2: Countries with over 100 thousand USD in impacts

name	num_exposures	economic_impact
Argentina	84975	.66 Million USD
Tanzania	35095	2.61 Million USD
United States	24924	.40 Million USD
Uzbekistan	45072	1.54 Million USD

(4 rows)
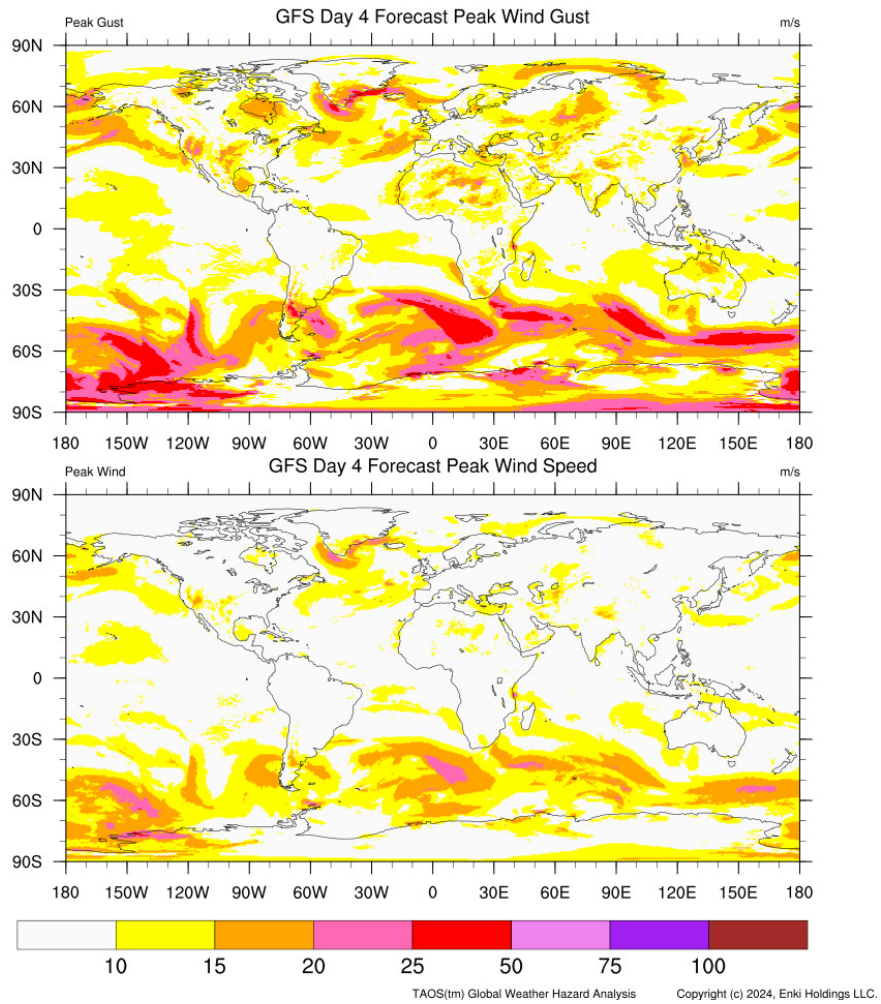
Figure 4.1: GFS Wind Forecast for day 4

Chapter 5

Forecast Day 5: 2024-05-05

Table 5.1: Global Economic Impacts for day 5

scenario	exposures	economic_impact
f005_20240501	154076	3.22 Million USD

Table 5.2: Countries with over 100 thousand USD in impacts

name	num_exposures	economic_impact
South Korea	6396	1.31 Million USD
Tanzania	11012	.14 Million USD
United States	113425	1.60 Million USD

(3 rows)

Figure 5.1: GFS Wind Forecast for day 5

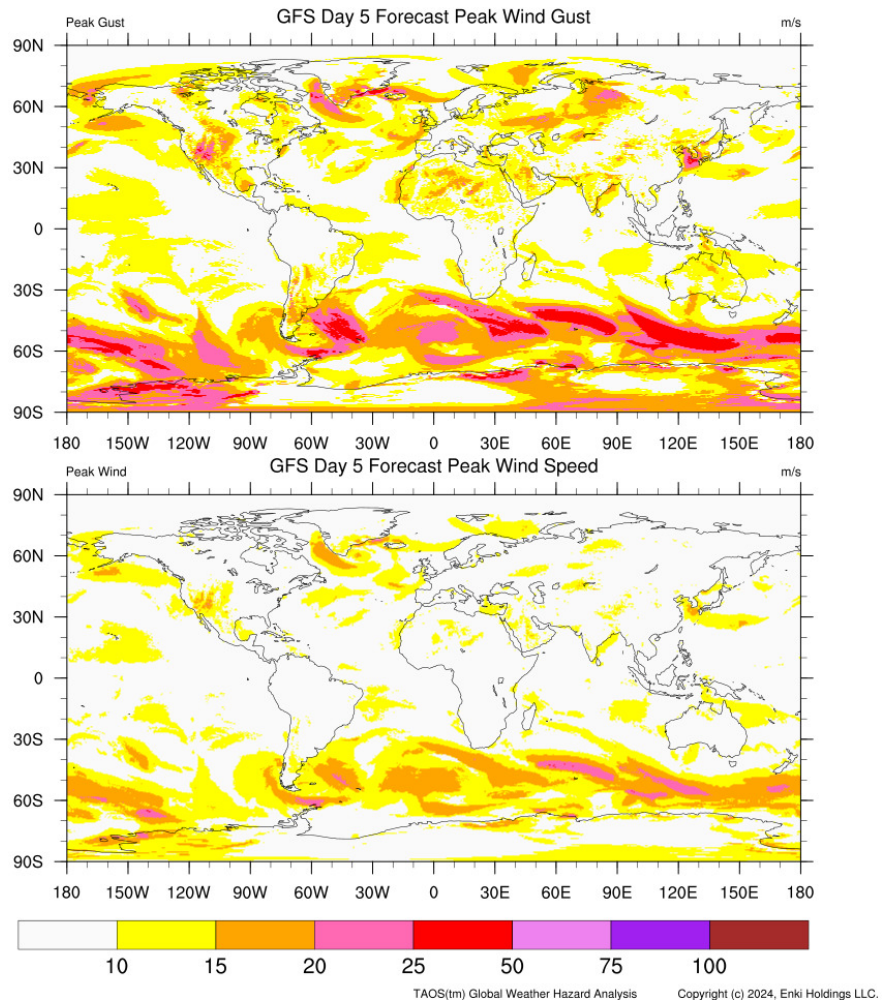# Chapter 6

Technical Notes

The TAOS^{tm} WX Global Analysis (TAOS/WX) is part of the TAOS^{tm} storm hazard modeling system. TAOS/WX ingests global or regional weather models and, using the same graphical processing systems, statistical methodologies, exposure, and damage models as the tropical cyclone (TAOS/TC) and earthquake (TAOS/EQ) packages, generates estimates of weather hazards and the economic impact of weather hazards on those exposures.

6.1   Input Meteorological Data Processing

This chapter describes the Beta version 1.0 of TAOS/WX, which is a hindcast and five day forecast using the US National Center for Environmental Prediction Global Forecast System (GFS) as the source of raw meteorological data. This data is processed in to standard TAOS^{tm} format NetCDF files for further processing by the TAOS^{tm} graphical and analytical tools.

6.1.1   Forecasts

Each day at 08z (5am EDT) the outputs of the primary 00Z GFS run are downloaded from NCEP using either the NOMADS or NOAA telecomunications gateway servers. The raw data sets in GRIB2 format are processed and converted in to NetCDF format for compatibility with TAOS^{tm} standard tools as well as for more efficient downstream processing and storage. The GFS data are processed by a streamlined version of the TAOS/TC model to generate exposure grid level wind, wave, storm surge, rain, and inland flood

products. These are then available for graphics generation or analysis by the exposure and damange processing system.

6.1.2 Hindcast

Along with the 00z forecast run, the data acqusition system fetches the simulations used by NCEP to "bootstrap" each GFS run and prepare for the next simulation. These are effectively 6 hour hindcasts, which are integrated to form hourly snapshots and maxima of the previous day. As with the forecast outputs, the GFS data are processed by a streamlined version of the TAOS/TC model to generate exposure grid level wind, wave, storm surge, rain, and inland flood products. These are then available for statistical analysis, graphics generation, or analysis by the exposure and damage processing system.

6.2 Exposure and Damage Processing

This is a brief overview of the exposure system and damage calculations with an emphasis on differences between TAOS/WX and other TAOS$^{\text{tm}}$ family processing. The processed GFS meteorological forecast is run against the TAOS$^{\text{tm}}$ basic exposure system at a resolution of 30 arc seconds (std30). The results are in 2021 US Dollars based on Purchasing Power Parity (PPP), with economic impact results generated for 3,614 level one administrative areas in 248 countries. For more complete information on the exposure data base see the latest version of the **TAOS$^{\text{tm}}$ Basic Exposure Data and Hazard Impact Estimation System Technical Overview**.

The Standard PPP based Exposure Data set is used for this analysis. NASA Global Population data and NOAA satellite derived land cover data are used in the exposure generation process to identify urban areas, agricultural areas, and other characteristics for creating an exposure classification for each inhabited 1km (30 arc second) land grid cell. The exposure system classifies each grid cell in to one of up to eight possible exposure categories and allocates an economic value to that cell. The Global Administrative Areas project (GADM) is the primary reference for National, Level 1 (State Equiv), and Level 2 (County Equiv) boundaries.

Damage fractions are computed using the same Fortran 90 program used in the TC and EQ systems (dmgmod). Wind damage curves are derived

from a third power function based on wind speed and the type of exposure. Further information (including damage curve plots) may be found in the Technical Overview.