

Early Period Reanalysis of Ocean Winds and Waves

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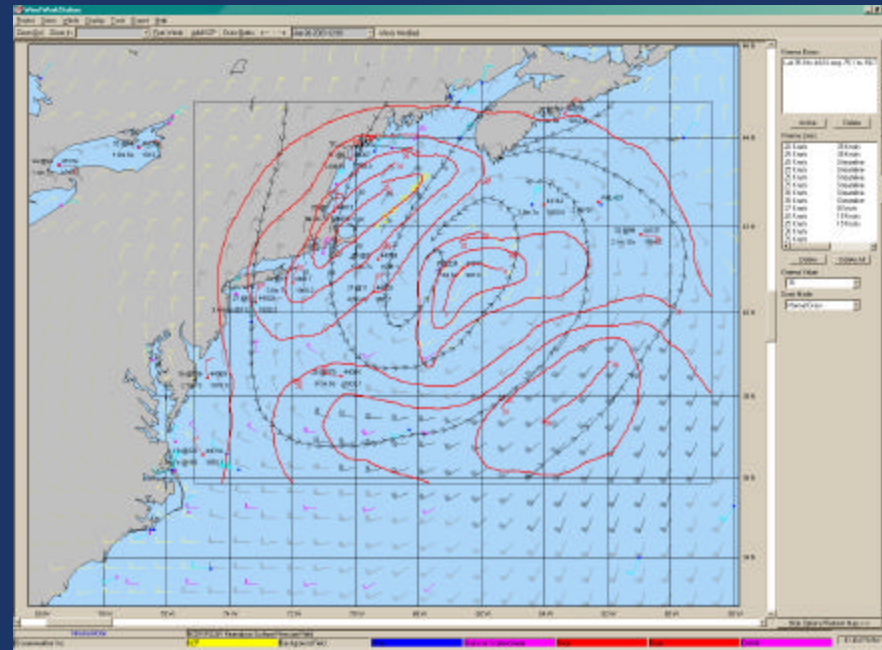
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AES40 North Atlantic Wind and Wave Climatology 1954-2004

Input Data: NCEP/NCAR
Reanalysis Fields + Insitu and
Satellite Data

Kinematic/Objective Reanalysis
of wind fields used to drive 3rd
generation model

How to address early period of
the 20th Century?



Introduction

Attempt to make the best possible use of the DSLP analysis archive to explore its use for extending the AES North Atlantic Wind and Wave Hindcast back to 1900.

AES40 North Atlantic Hindcast spans 50-year period of 1954 to 2003

NRA Source data available to 1948

In situ observations lacking in early period for reanalysis

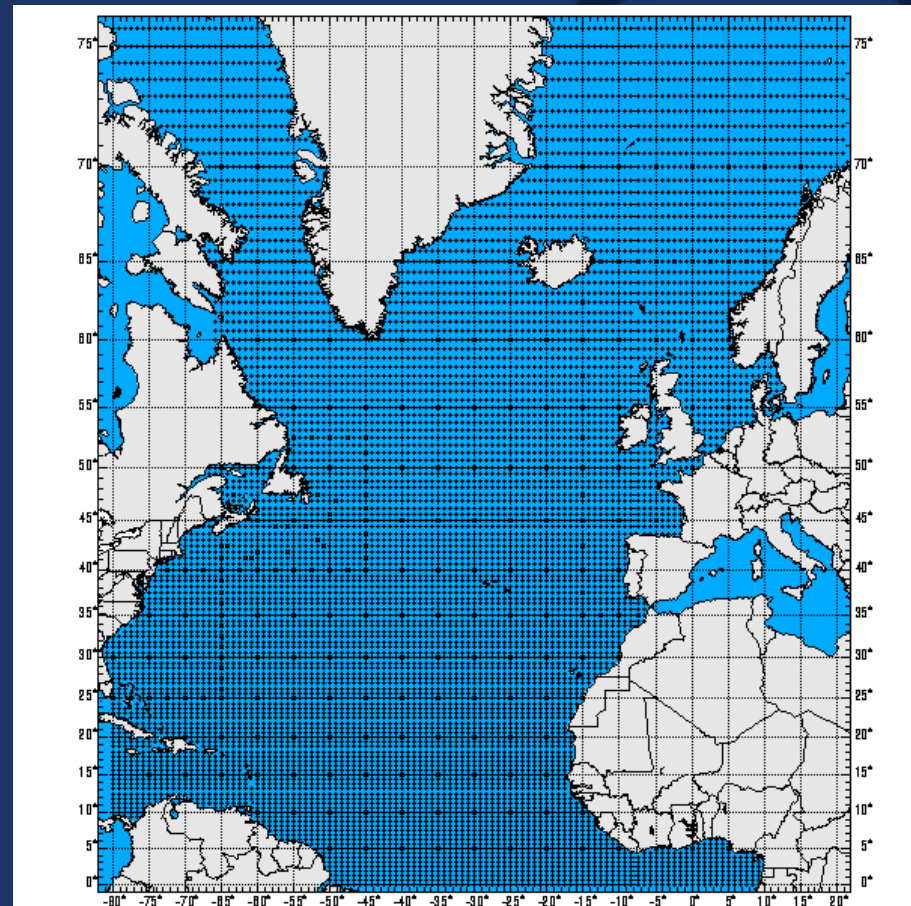
Daily Sea Level Pressure Data compiled from NCAR available to 1899

Data Sources

AES40 North Atlantic Wind and Wave Climatology

6-hourly winds and waves archived at $.625^\circ \times .833^\circ$ latitude-longitude grid

Used as reference data set

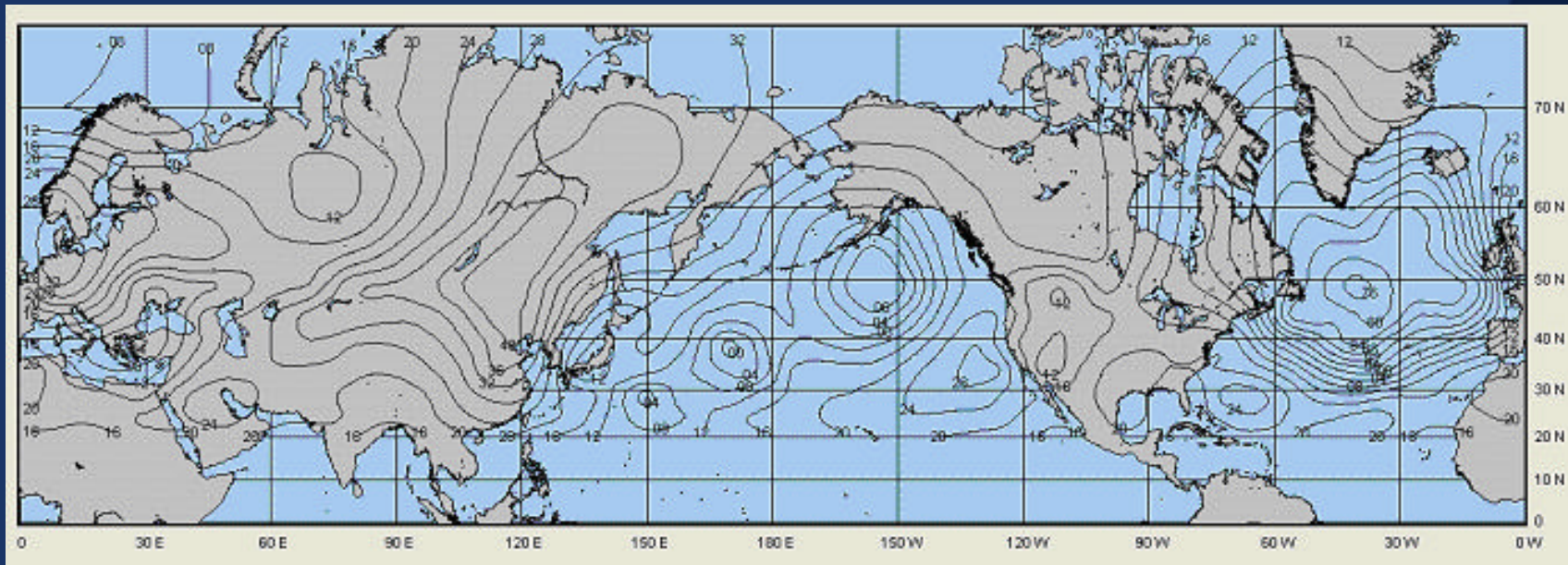


Data Sources

Daily Sea Level Pressure Data (DSLPL)

5° x 5° Northern Hemisphere Sea Level Pressures

Available 1899-Present from UCAR DDS Data Server



Methodology

1. Compute surface winds from DSLP data using PBL model

Air/sea temperatures from ship report based climatology

Winds 0N-15N derived from NCEP/NCAR long term average

2. Interpolate daily computed winds to model time step using moving centers algorithm

Tracks of major systems tracked manually

3. Run resulting interpolated winds through AES40 wave model

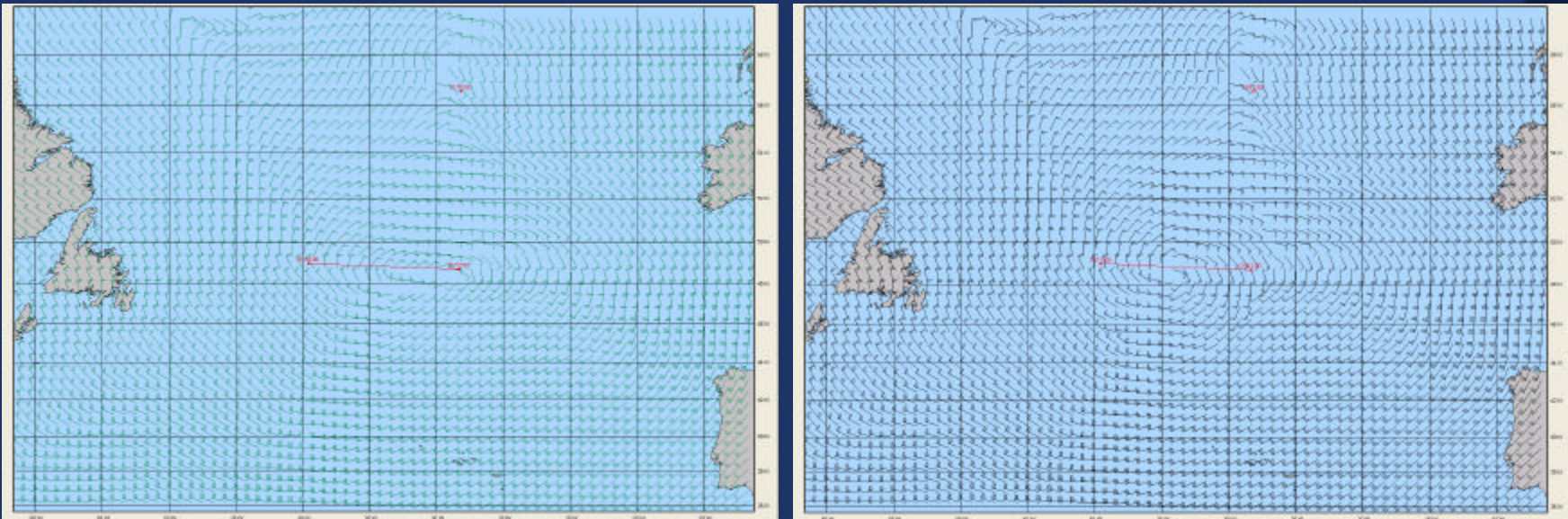
3rd Generation wave model applied in original hindcast

Ice Tables computed from long-term monthly averages

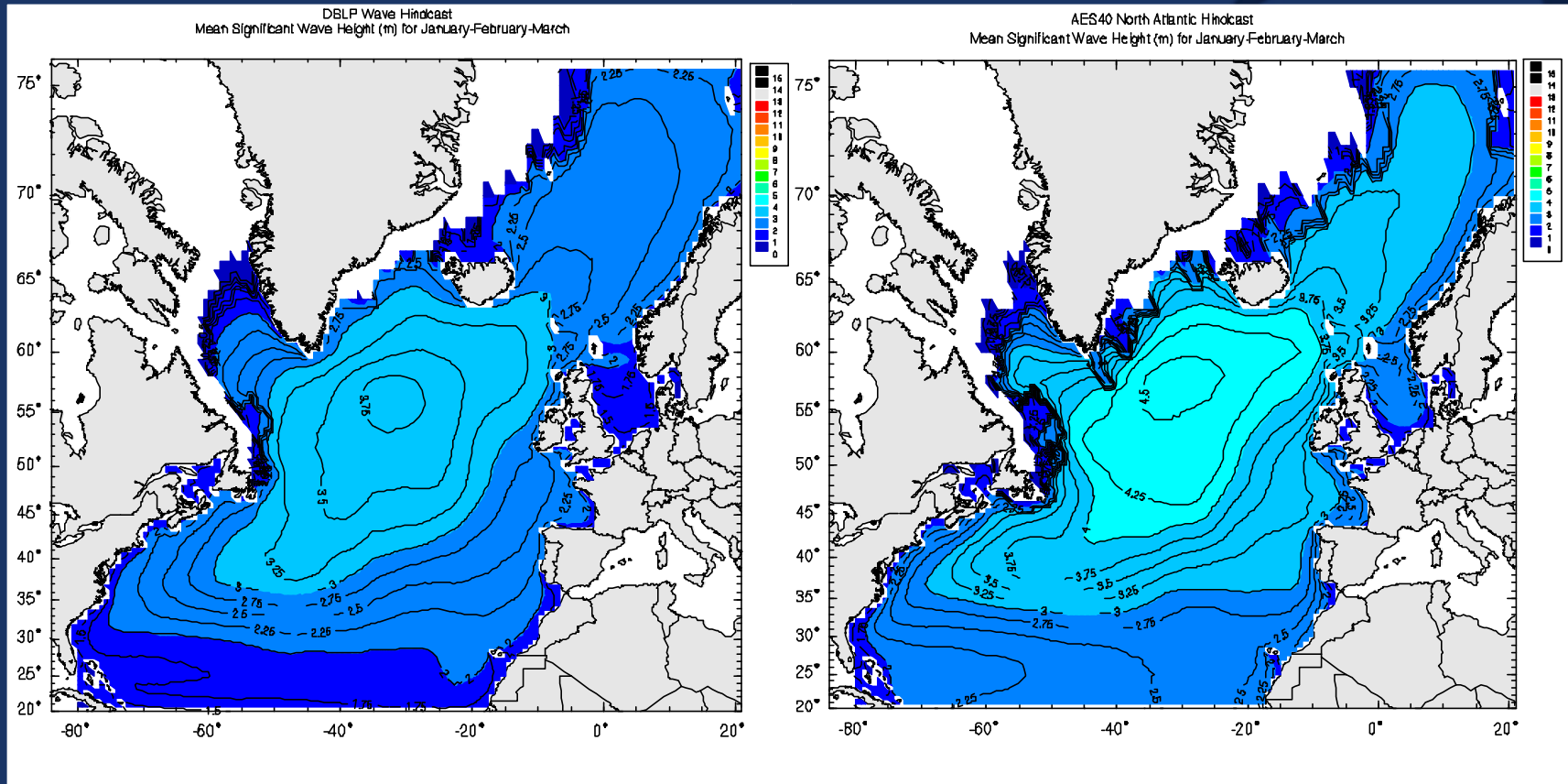
4. Compare resulting DSLP hindcast to AES40 hindcast during the year 1956

Moving Centers Interpolation

Preserves center in time interpolation and reduces “smearing” of wind fields

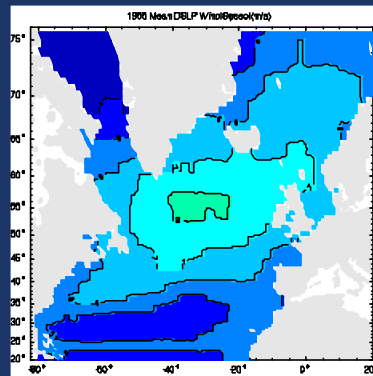
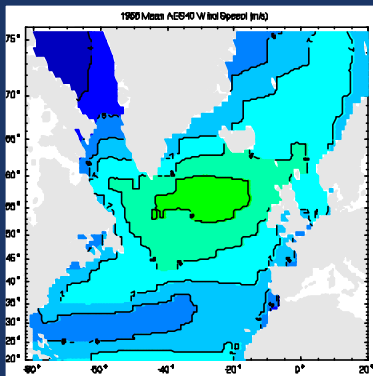


DSLP-AES40 J-F-M 1956

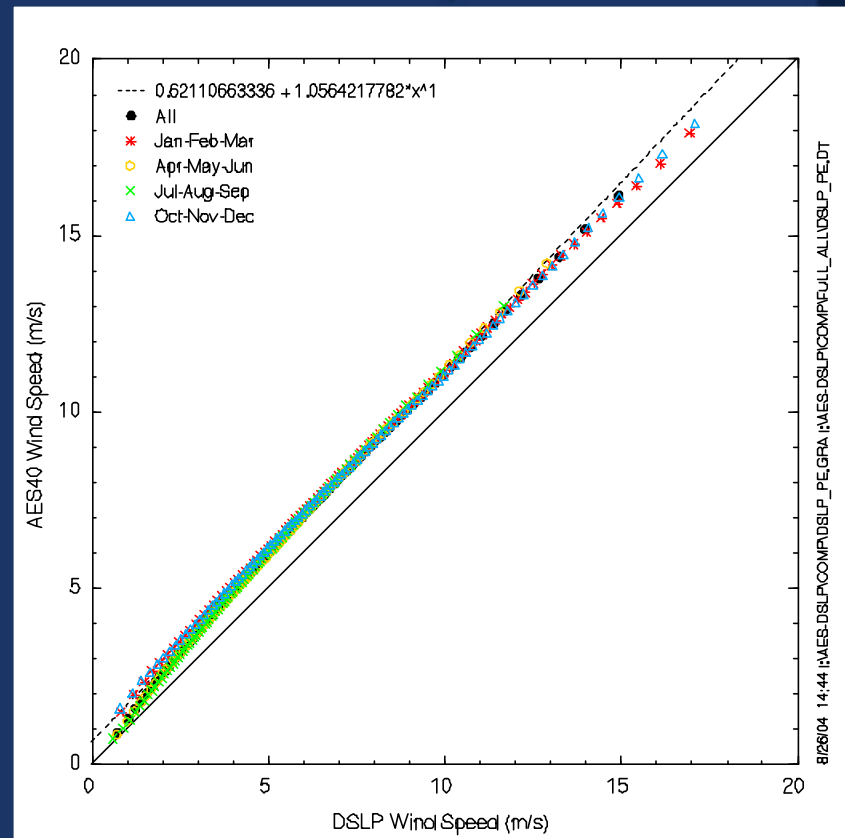


DSLIP-AES40 1956 Winds

Quantile-Quantile (1%-99%) Comparison
(all locations stratified by season)

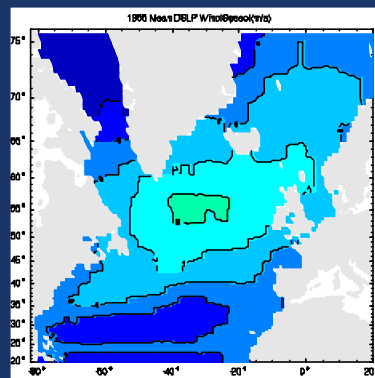
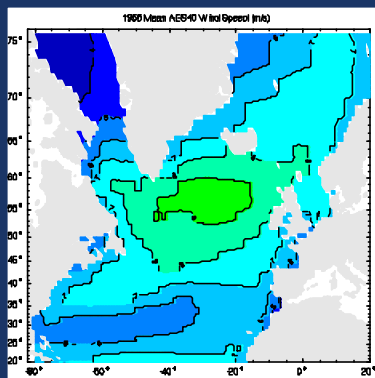


Mean Wind Speeds

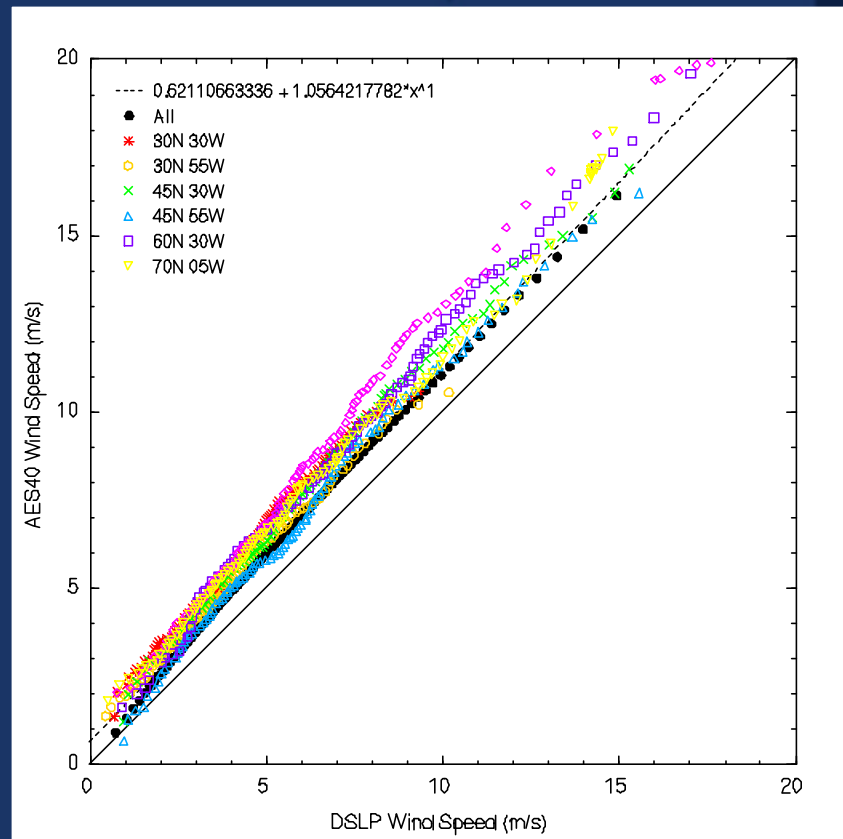


DSLIP-AES40 1956 Winds

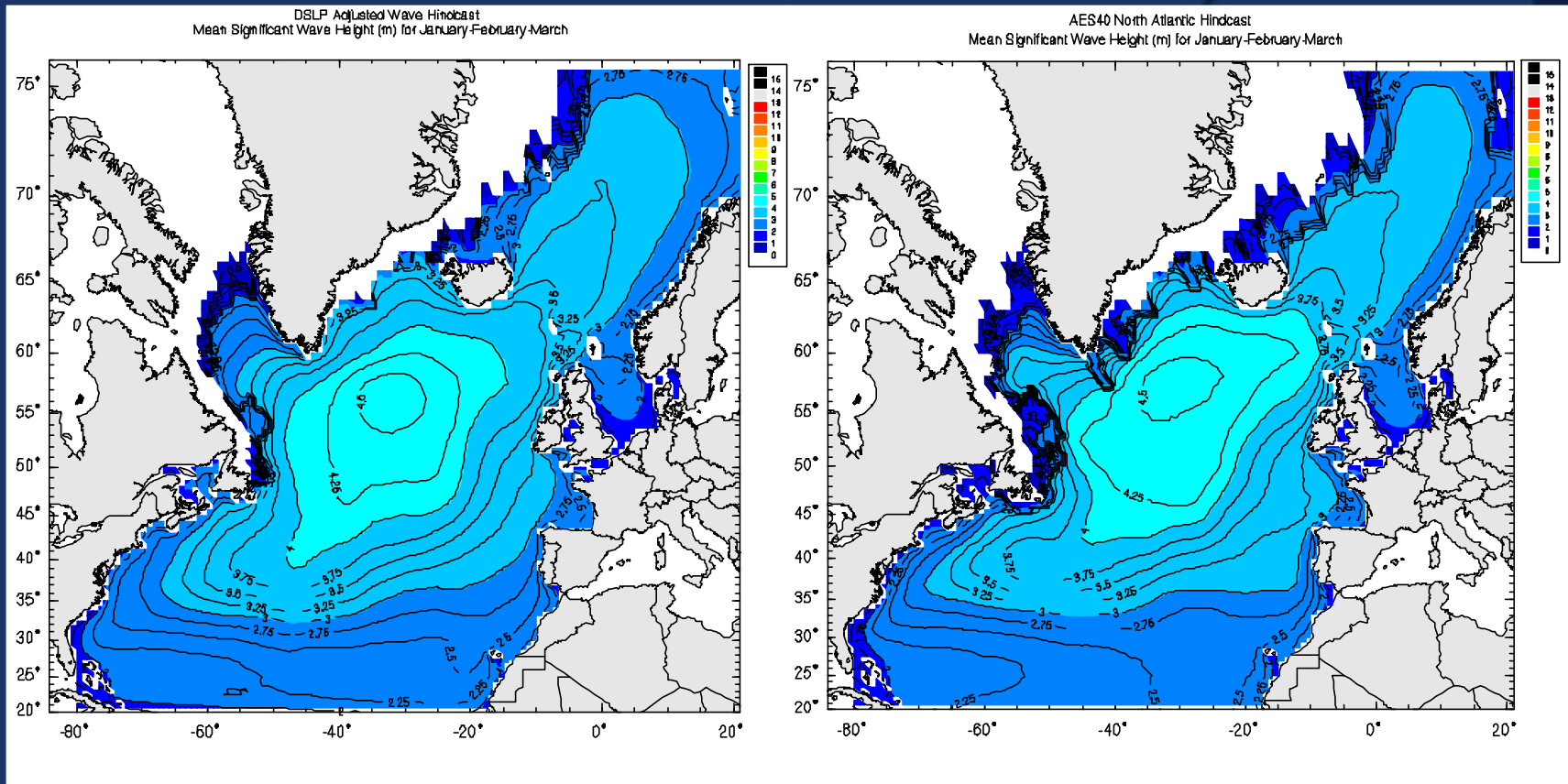
Quantile-Quantile (1%-99%) Comparison
(stratified by select locations)



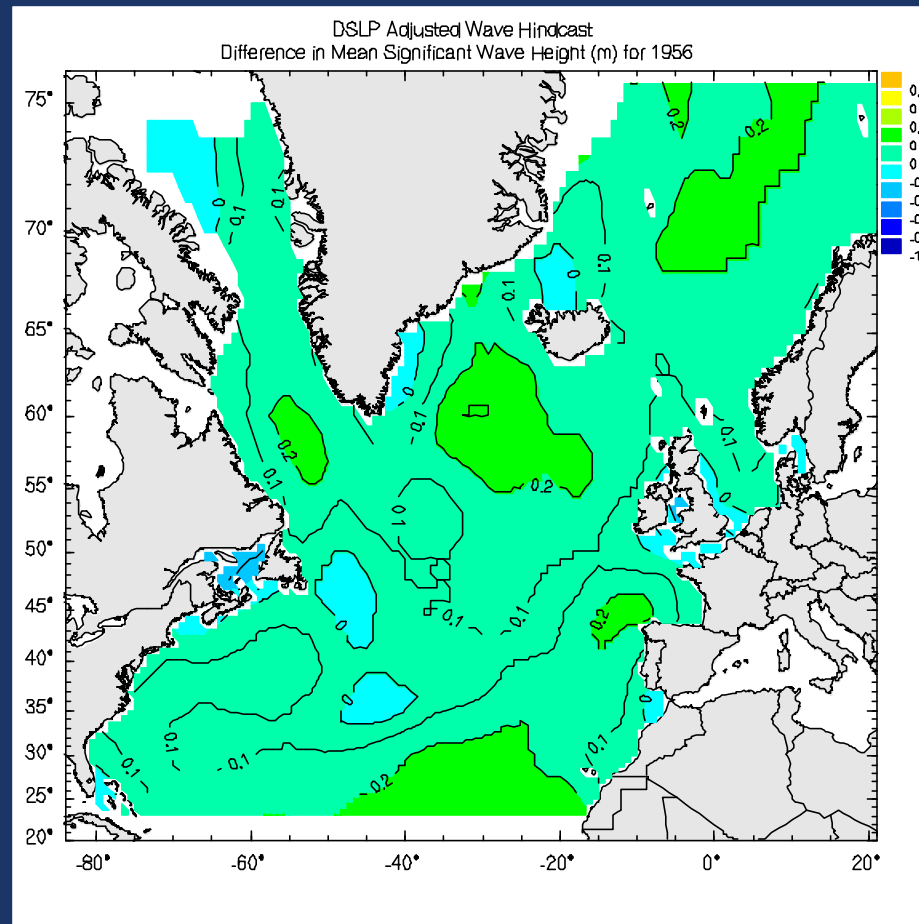
Mean Wind Speeds



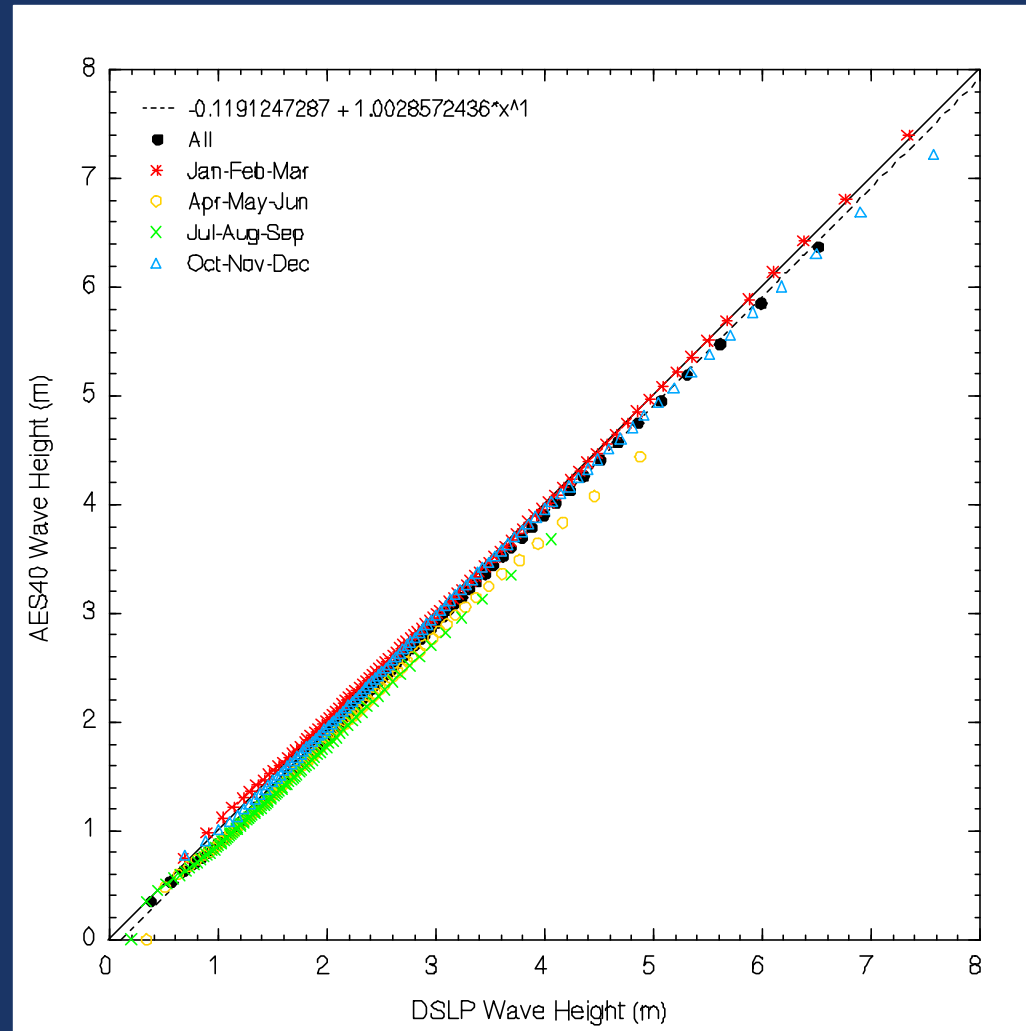
DSLIP ADJ-AES40 J-F-M 1956



DSLP ADJ-AES40 1956



DSLIP ADJ-AES40 1956



Test Year: 1990

Serves to test methodology with independent period

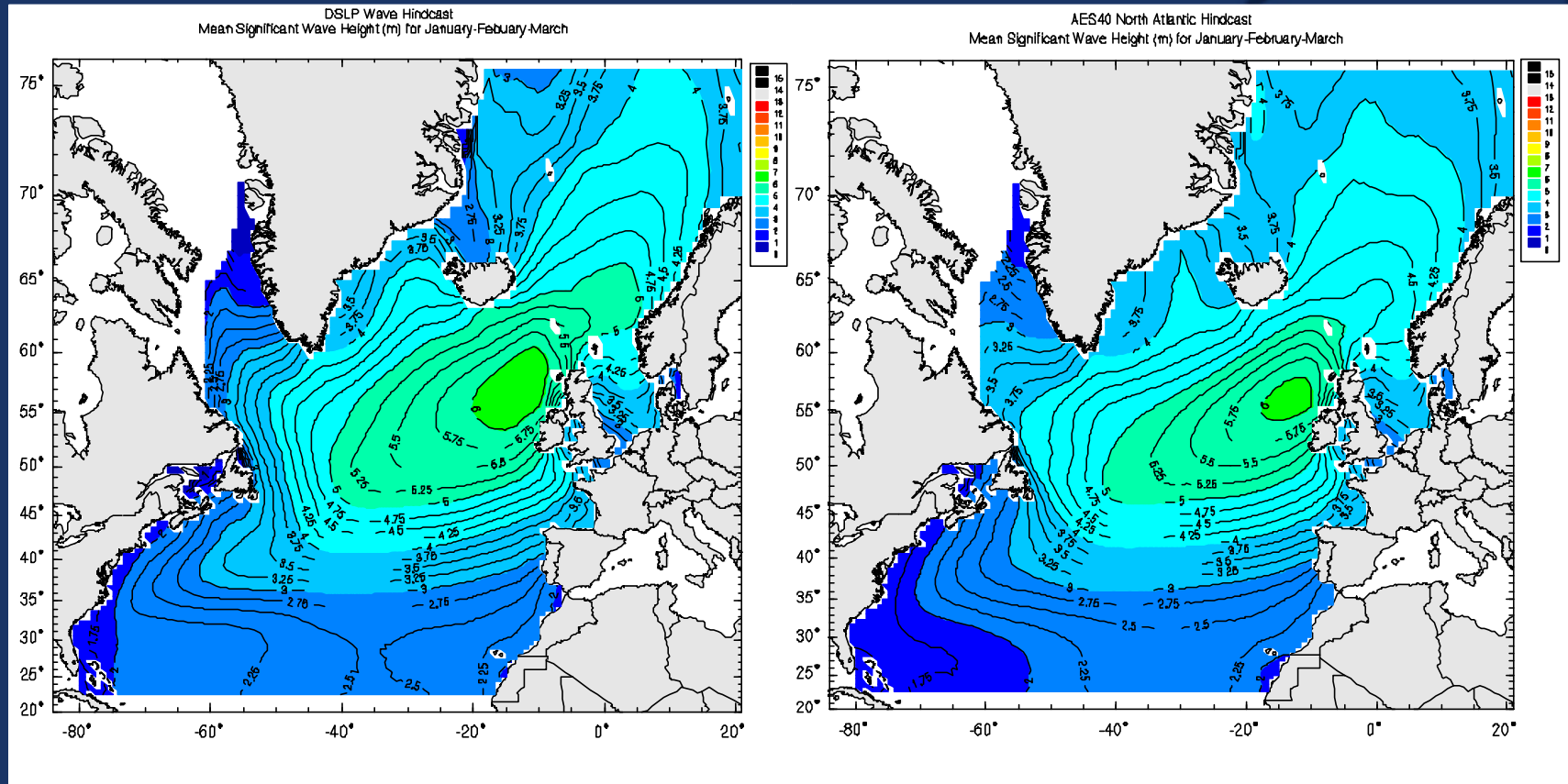
Strongly positive NAO year selected

DSLIP available twice per-day (reduced set to daily)

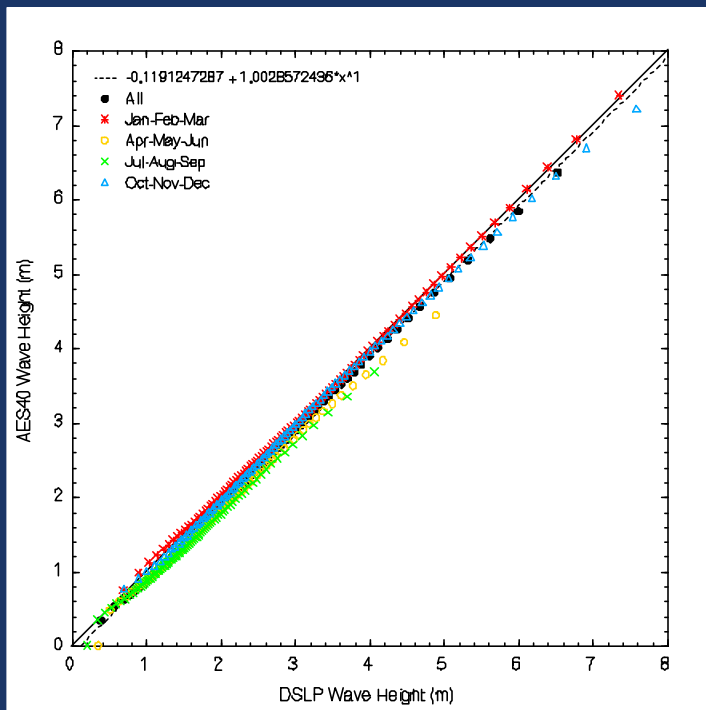
Run through wave model using same methodology

1906 also run for comparison to 1990 (another NAO year)

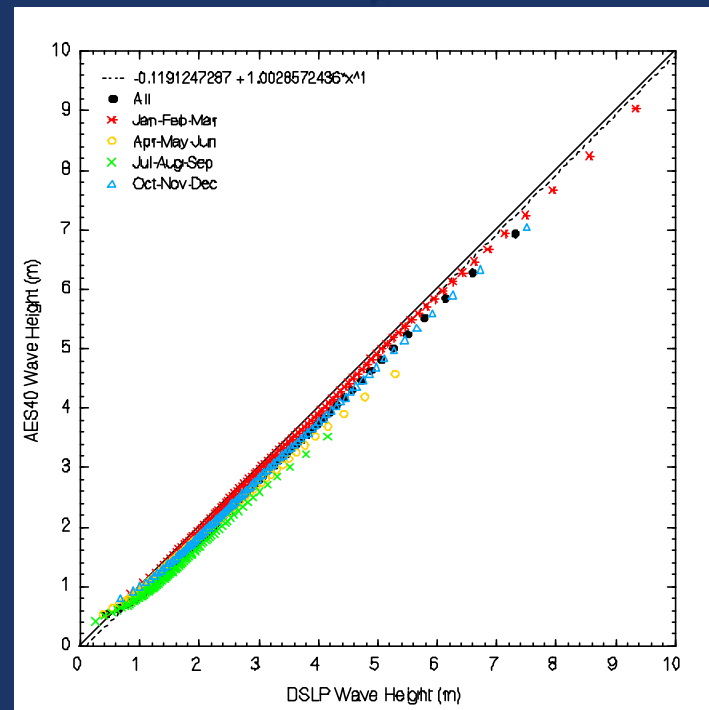
1990 DSLP/AES40 Comparison



1956/1990 Comparisons

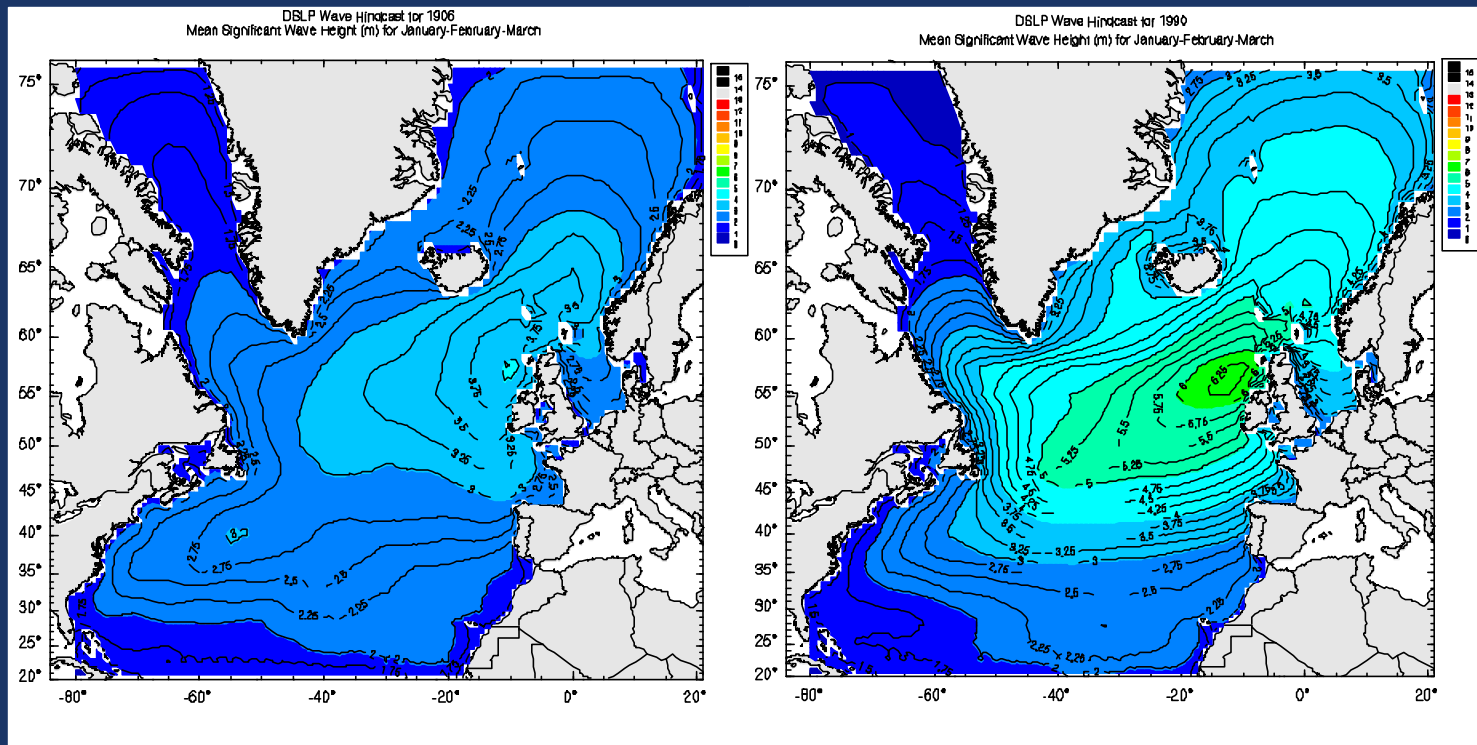


1956



1990

Wave Comparisons in 2 NAO Years



1906 (NAO Index of 2.29)

1990 (NAO Index of 3.88)

Summary/Conclusions

Methodology explored for extending AES40 hindcast to 1900

Wind adjustment required to bring results in line (temporal bias)

Independent year (1990) resulted in mean wind bias of -0.20 m/s and wave bias of 0.21 meters with associated scatter indexes of 28% and 26%

Methodology looks promising – more investigation in seasonal wave differences required