Reynolds/Chelton Spectrum Test for comparison of L4 analysis methods

What, How to, and Future

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GHRSST announcement on April 16, 2013 (check your email)

Download the test package from:
ftp://ghrsst@podaac.jpl.nasa.gov

Get the login password by emailing:
Ed.Armstrong@jpl.nasa.gov

Background: Reynolds/Chelton Spectrum Test

- The analysis (interpolation) methods used by NCDC/OI and OSTIA L4 products were compared in the paper by Reynolds et al (2013): "Objective Determination of Feature Resolution in Two Temperature Analysis", *Journal of Climate*.
  - Model-simulated SST fields used as the "truth".
  - Spectral decompositions to evaluate smoothness.
- Other L4 producers showed interest in the comparison study during the previous IC-TAG session (Tokyo 2012).
- Reynolds/Chelton delivered comparison data/codes to PO.DAAC in late 2012 for public distribution.

What is it? : Reynolds/Chelton Spectrum Test

- Simulated SST data (your inputs; 4 versions in a L3-like file):
  - Fully gridded version.
  - Version with data voids.
  - Fully gridded with noise.
  - Version with data voids and noise.

  daily over 2 months, January and July (1993) = 62 days.
- Spectral analysis codes from Reynolds/Chelton.

  5 Fortran codes to: subset your output to 6 regions, compute auto-spectra (spatial Fourier magnitudes) and coherence spectra, and compute monthly averages of the spectra.
- Minimal utility codes from PO.DAAC.

  Fortran example (`analysis_template.f`) to format your output for the Reynolds codes.
  MATLAB codes to print and plot the spectral outputs.

Contents:

HowTo.txt

Results/ (= results from *Reynolds et al 2013* ?)

Reynolds_et_al_2013.pdf

Simulated_Datasets/ (= Your inputs)

spectest.zip

Contents of spectest/ :

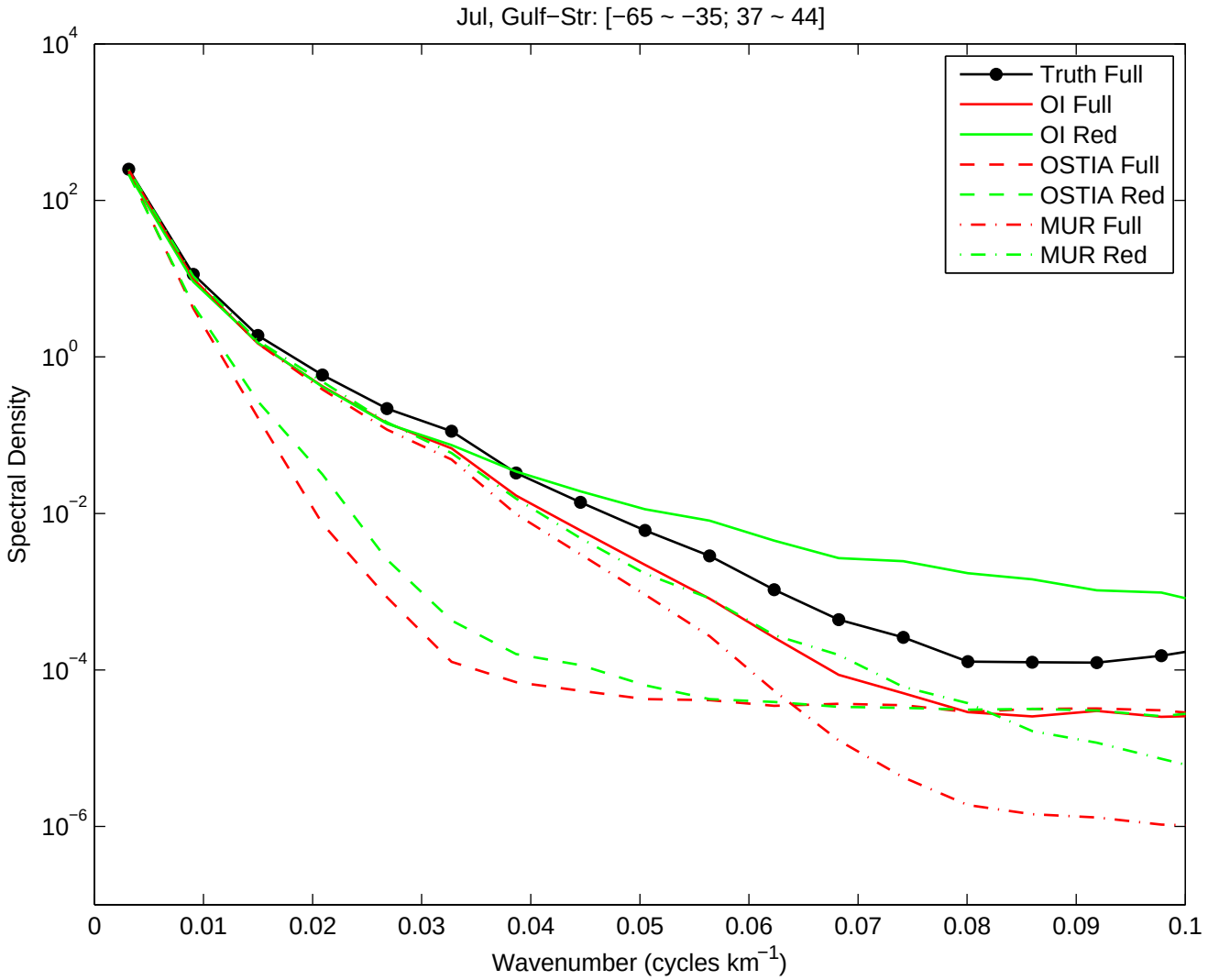
ReadMe.txt	makefile	aspec/
data/	region-2mon.f	cspec/
region/	daily-auto-spec.f	analysis_template.f
aspec-day/	daily-co-spec.f	listaspec.m
aspec-ave/	month-auto-spec.f	plotaspec.m
cspec-day/	month-co-spec.f	listcspec.m
cspec-coh/		plotcspec.m

Test Procedure (What you would do):

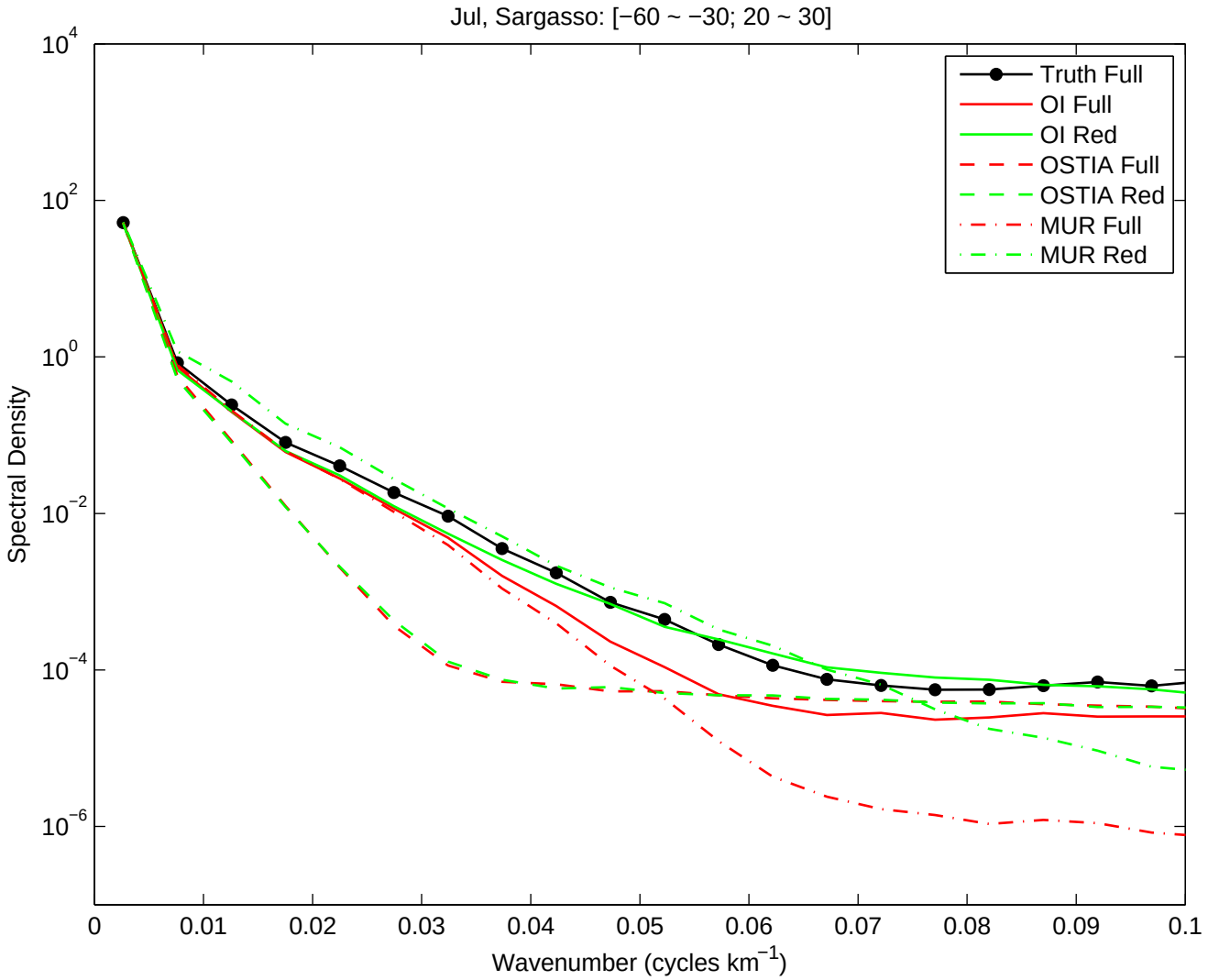
- Download the simulated data.
- Feed the data set (each of 4) to your analysis routine.
- Re-grid your analysis output to "4km Pathfinder grid": a 8192×4096 grid where $\Delta\text{lon} = 360/2^{13}$, $\Delta\text{lat} = 180/2^{12}$.
- Save your results in `spectest/data/` directory, using certain file names.
- Apply the given 5 Fortran codes, and find the results in `aspec-ave` and `cspec-coh` directories.

  4 inputs $\times$ 6 regions $\times$ 2 months $=$ 48 spectra
  ... for each of auto- and coherence-spectral procedures.

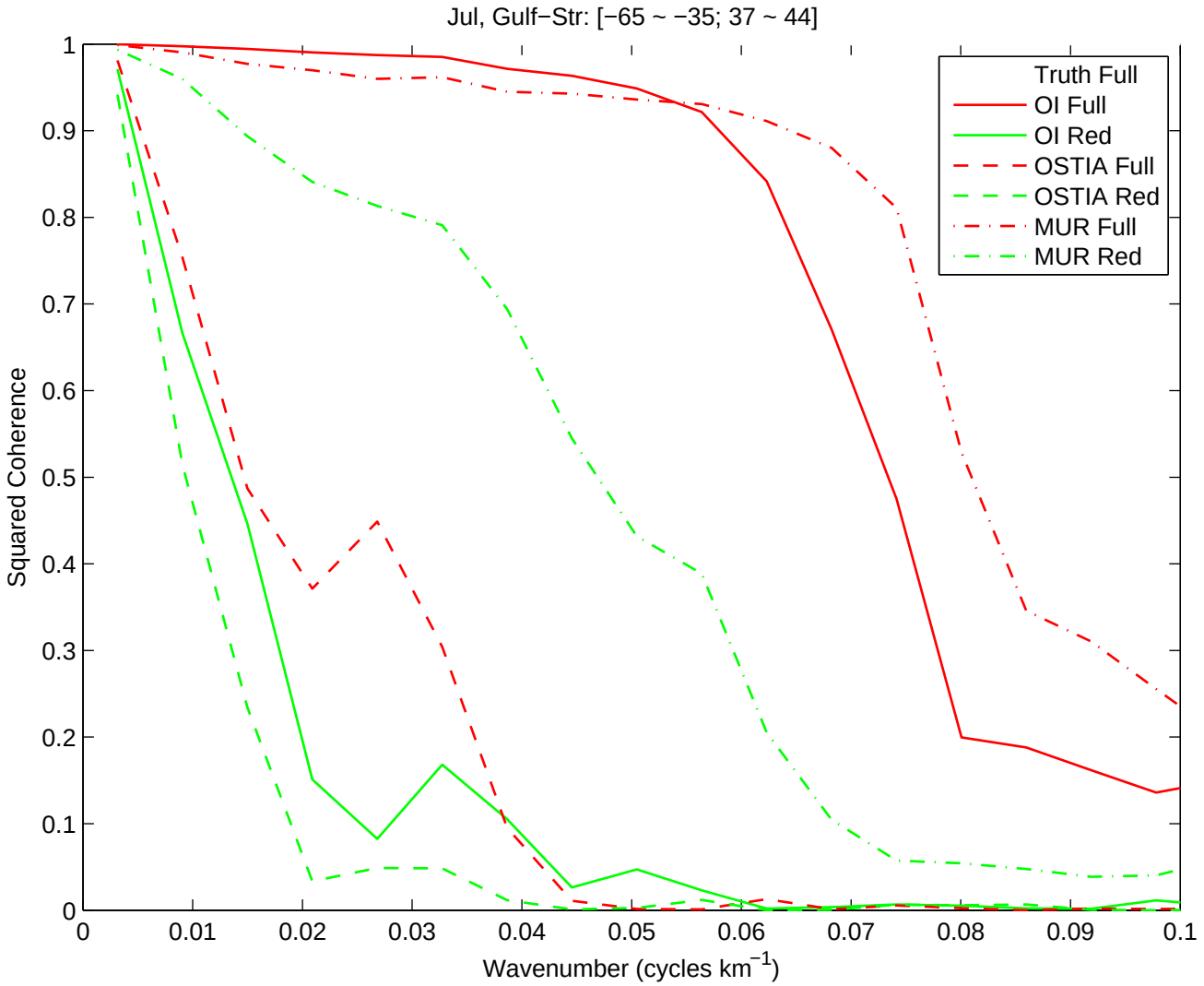
“Fig. 6” (auto-spectra) Gulf Stream ...



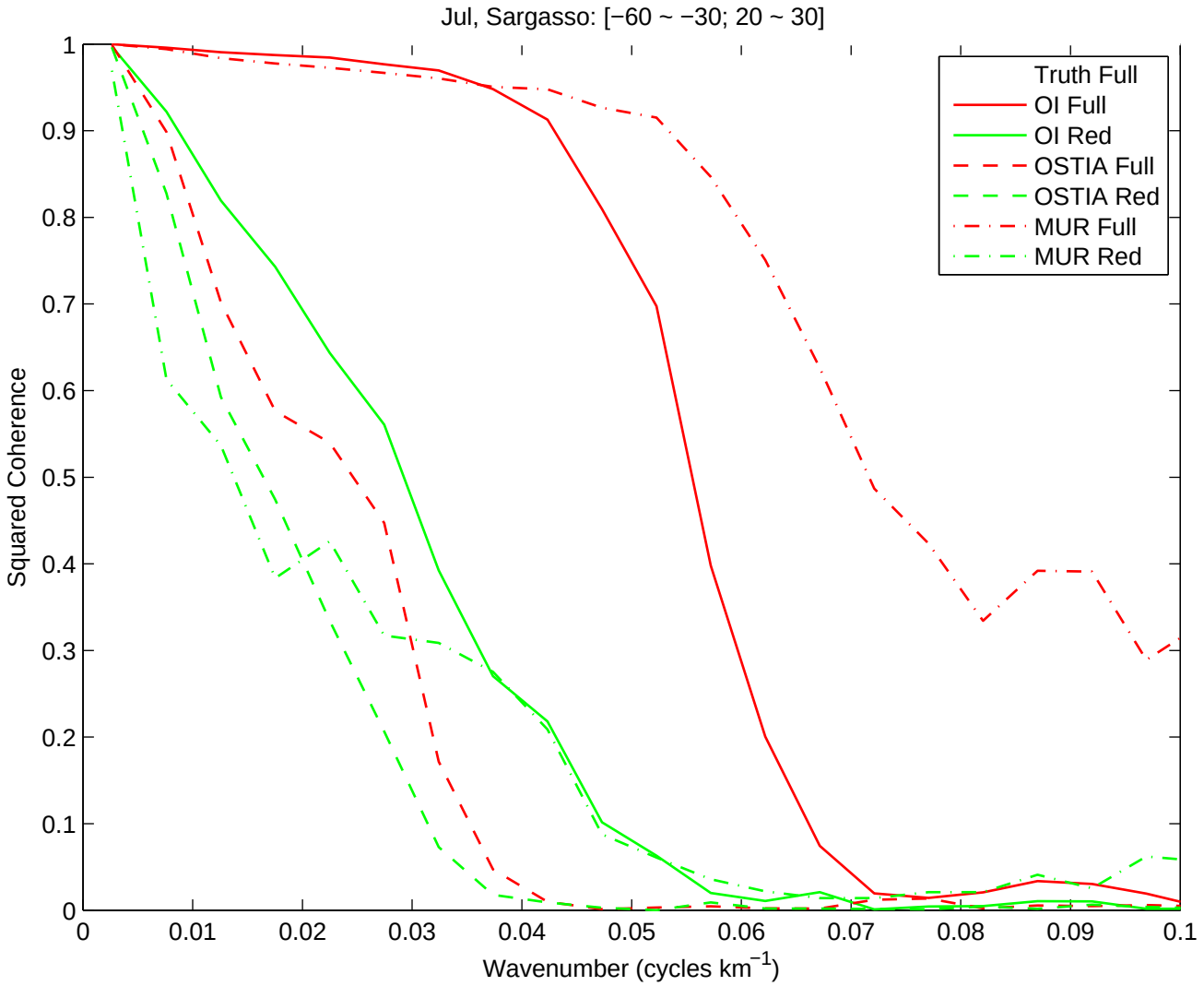
“Fig. 6” (auto-spectra) Sargasso Sea ...



“Fig. 7” (coherence spactra) Gulf Stream ...



“Fig. 7” (coherence spactra) Sargasso Sea ...



Summary, comments, and future

- Reynolds/Chelton codes are distributed with minimal intervention for authenticity (w.r.t. the journal article).
- Any L4 procedure can be compared to the article results.
- Some particular discrepancies to the figures in the article
  $\longrightarrow$ update the `Results` directory contents?
- Possibly cumbersome to use, e.g.:
  regridding of your output; input data are not L2 format.
- Fourier analysis not applied to the entire region (currently only along the center latitude).

... future (potential improvements?)

- Flexible Fourier analysis routine to:
  - eliminate regridding the output (keep your grids).
  - average the spectra over the entire region.
- Sample the simulated SST ("the truth") more realistically (not pre-binned), e.g., sample in time (to simulate L2 better). Perhaps higher spatial resolution.
- Do you want PO.DAAC to do all the spectral analysis?

  You would download the input data and submit your L4 analysis; PO.DAAC does the rest and post/update the results. Do you want that? (Really?)