



RADS 4: A New Interface to Precise and Fast-delivery Altimeter Data from Geosat to CryoSat



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Summary

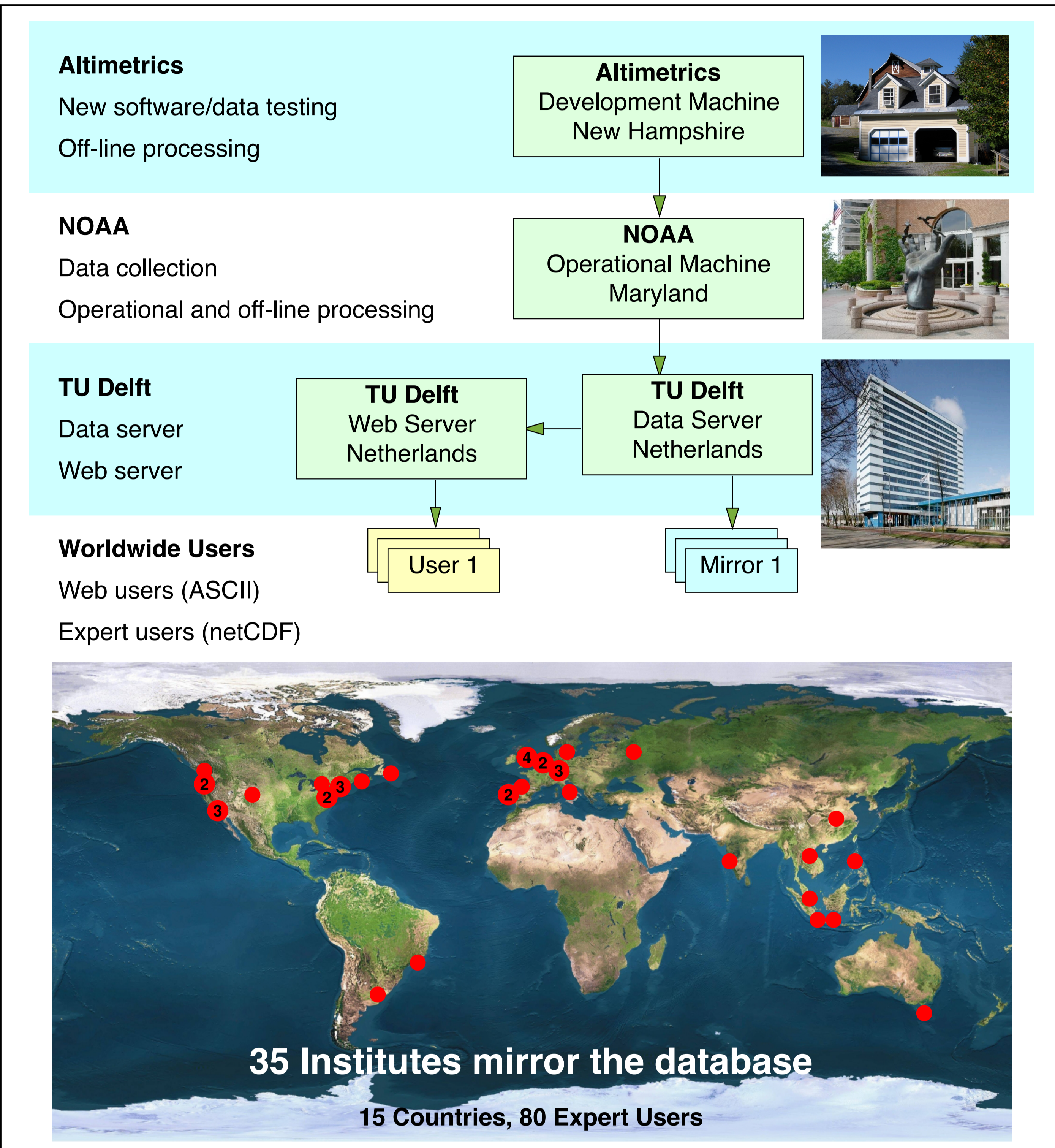
An operational capability has been added to the database lately, with the introduction of near-real time data. Currently Envisat FDMAR, Jason-1 NRT, and Jason-2 OGDR data are being inserted twice a day, extending the more precise GDR- and IGDR-based data to within 12 hours of real-time. In this way a user can exploit not only the data of nine different

altimeters, but can also conduct both science and operational activities in a one-stop shopping fashion. Full or partial mirrors of the database now serve approximately 80 expert users across 35 institutes in 15 countries.

The database will be fully reprocessed to incorporate the most up-to-date altimeter data, the latest instrument and geophysical corrections, new Envisat "version 2" standards and ocean products from CryoSat.

The software interface to the database has also been redesigned, from the ground up, using Fortran 95. The code is parallelized, so the processing can take advantage of the multiple processors currently available in most desktop computers.

On the server side in Delft, an rsync server has been added to better serve the growing number of expert users who now mirror the database in its entirety.



Processing and data access

- **Twice daily processing** of fast-delivery (near realtime) and interim GDR products of Jason-1, Envisat, and Jason-2.
- **Continuous and consistent datasets** from start of mission to a maximum of 15 hours old data.
- **Downloadable in ASCII** form (for small projects) through web interface: rads.deos.tudelft.nl
- **Rsync server** for netCDF data. Easy mirroring of all or parts of the data set. rsync://rads.deos.tudelft.nl (password protected)
- **To be deployed end 2011: OpenDAP server**
- Software tools for data extraction, statistics, collinear track analysis, crossover generation.

New in RADS 4

- **Fortran 95.** Almost complete recoding from scratch. Easily scalable with flexible memory allocation. Parallelization of vector (*pass data*) math.
- **New and updated utilities.** Mostly compatible with RADS 3. **rads2asc, rads2nc.** RADS data selection and conversion to ASCII or netCDF. **radscolin.** Collinear track stacking program. **radsstat.** Averages of data fields per pass, day, or cycle. **radsxogen, radsxolist.** RADS crossover generator and lister. **rads2grd.** Grid one data field against two other.
- **Variables by name.** Addressing variables will no longer be by field number but by name, similar to the variables in the Jason netCDF GDRs. Numbers will be allowed for backward compatibility.
- **Settings per variable.** Each data field will be allowed its own editing criteria, instead of a single edit criterion for all variables of the same type (i.e. all ionospheric corrections).
- **XML configuration files.** Global or per mission. Instead of namelist file. More flexible and readable. Conversion tool provided.

XML configuration

```
<var name="time" field="101">
  <long_name>time</long_name>
  <units>seconds since 1985-01-01 00:00:00</units>
  <format>f16.6</format>
  <netcdf>time</netcdf>
  <datatype>time</datatype>
</var>
<var name="mss_dtu10">
  <long_name>DTU10 mean sea surface height</long_name>
  <units>m</units>
  <limits>-200 200</limits>
  <format>f10.4</format>
  <grid x="lon" y="lat">DTU10MSS_1min.nc</grid>
</var>
<alias name="mss" field="16">mss_dtu10</alias>
<var name="sla" field="0">
  <long_name>sea level anomaly</long_name>
  <units>m</units>
  <limits>-2 2</limits>
  <format>f8.4</format>
  <math>alt range SUB dry_tropo SUB wet_tropo SUB iono SUB inv_baro SUB solid_tide SUB
ocean_tide SUB load_tide SUB pole_tide SUB ssb SUB mss SUB refframe SUB
</math>
  <quality_flag>swh sigma0 range_rms range_rms_val flags</quality_flag>
  <datatype>sla</datatype>
</var>
```

For backwards compatibility

Directly from netCDF data

Self-defined variable

Interpolated on the fly from external grid

"Alias" is a shortcut

Editing limits

SLA is computed on the fly using RPN math

Database

- **Geosat.** Both Geodetic and ERM mission. All up-to-date models and Goddard orbits based on GDR-C' standards. Updated SSB models. Data of Geodetic mission retracked. **ERM data to follow.**
- **ERS-1 and ERS-2.** New orbits from REAPER project and up-to-date models. Corrected radiometer drift and gain loss and applied neural network algorithm. Fixed varying sigma0 bias. Updated SSB models. Removed scaling error in ECMWF wet tropo correction.
- **TOPEX/Poseidon.** Goddard GDR-C' orbits. Corrected radiometer drift. Fixed C-band bias. Updated windspeed (Gourrion) and SSB models. Corrected SWH degradation. Removed scaling error in ECMWF wet tropo correction.
- **Jason-1.** GDR-C with Goddard GDR-C' orbits. Adjusted sigma0 for bias with TOPEX and use (Collard) windspeed model. Moved all JMR data by one second and apply Enhanced JMR Product (coastal). Reducing sigma0 noise using Quartly algorithm.
- **Envisat.** Consistent orbits from ESOC and CNES. Corrected MWR side lobe effects. Hybrid SSB model. Fixed S-band sigma0 and range bias. Fixed USO drift. Improved rain flag algorithm. Applied drift on 23.8 GHz brightness temperatures and recompute wet tropospheric correction using neural network algorithm. **Update all version 1 data to version 2 standards. Late 2011.**
- **Jason-2.** Reduced sigma0 noise by adjusting for apparent off-nadir angle. Moved all AMR data by one second and applied Enhanced AMR Product (coastal).
- **Cryosat-2.** Low bit-rate ocean data from LRM/FDM Level 2, **patched for numerous bugs.**

Up-to-date corrections

- **Tides.** FES2004, GOT4.7 and GOT4.9 with appropriate long-period and load tides. WebTide (around Canada and US). Consistent pole and solid earth tides.
- **Geoid, MSS.** EGM2008 (geoid and MSS), CLS01 MSS, DNSC08, **DTU10 and CNES-CLS11 (currently being phased in).**
- **Bathymetry.** DNSC08 being replaced by DTU10.
- **Wind/wave.** WaveWatch 3 model.
- **Inverse barometer.** Latest version of MOG2D (now DAC).
- **Meteo.** NCEP and ECMWF ERA-interim reanalysis fields.
- **Ionosphere.** Smoothed dual-frequency correction. JPL GIM maps and NIC09 climatology.

Program sample

```
use rads ! Use rads module
type(rads_sat) :: S ! Structure that contains all mission information
type(rads_pass) :: P ! Structure for pass information
real(eightbyte), allocatable :: lon(:), lat(:), sla(:)
integer :: cycle, pass, i
call rads_init(S, 'e1') ! Initialize RADS. Select ERS-1. No mission needed!
do cycle = 1,30 ! Loop through 30 cycles
  do pass = 1,10,2 ! List ascending passes 1-9
    call rads_open_pass(S, P, cycle, pass) ! Open pass file
    allocate(lon(P%ndata), lat(P%ndata), sla(P%ndata)) ! Allocate memory
    call rads_get_var(S, P, 'lon', lon) ! Get the data
    call rads_get_var(S, P, 'lat', lat)
    call rads_get_var(S, P, 'sla', sla)
    do i = 1,P%ndata
      write(*,*) lon(i), lat(i), sla(i) ! Print the data
    enddo
    deallocate(lon, lat, sla) ! Deallocate memory
    call rads_close_pass(S, P) ! Close pass
  enddo
enddo
call rads_end(S) ! End RADS. Free structure.
end
```