

Annex X

**SATELLITE-BASED OCEAN WAVE DATA BASES
PART I : SUMMARY**

| COUNTRY | SATELLITE | INSTRUMENT | AREA COVERED | TIME SPANNED | PARAMETERS AVAILABLE | RELATED INFORMATION | ADDRESS |
|-----------|--------------------|---------------------------------------|------------------------------------|--|--|---|---|
| GERMANY | ERS 1/2 | Scatterometer | 30°N - 90°N | ERS-1 1991-1996 | Wave height | Low-rate fast-delivery data via GTS QC: no Publications: no | Eberhard Muller Business Area Research and Development Deutscher Wetterdienst Postfach 10 04 65 63004 Offenbach Germany Ph: +49 69 8062 0 Fax: +49 69 8062 2880 |
| | | Altimeter Synthetic Aperture Radar | 90°W – 90°E | ERS-2 1996 on Irregular intervals. | Wind speed, direction 2-D wave spectra Raw data: no Statistics: no | | |
| JAPAN | ERS 1/2 | Scatterometer | Global | March 1996 on | Wave height | Algorithm: CMOD4, CMOD5 QC: no Publications: no | Marine Meteorological Division Climate and Marine Department Japan Meteorological Agency 1-3-4, Otemachi Chiyoda-ku Tokyo 100 Japan Ph: 81-3-3212-8341 Fax: 81-3-3211-6908 |
| | | Altimeter Synthetic Aperture Radar | | | Wave height Wind speed, direction 2-D wave spectra Raw data: no Statistics: no | | |
| | TOPEX/ Poseidon | Altimeter | Western North Pacific | March 1996 on | Wave height Raw data: no Statistics: no | Algorithm: CMOD4, CMOD5 QC: no Publications: no | As above |
| SINGAPORE | ERS 1/2 | Synthetic Aperture Radar | Within 3000 km radius of Singapore | September 1995 on, on days when passes are allocated | SAR images: single look and geo-referenced detected images Statistics: no | Algorithm: N/A QC: no Publications: no | Prof. Lim Hock Centre for Remote Imaging, Sensing and Processing National University of Singapore, Kent Ridge, Singapore 119260 Republic of Singapore Ph: (65) 772 3220 Fax: (65) 775 7717 crisp@leonis.nus.sg |
| | | RADARSAT | Synthetic Aperture Radar | Within 3000 km radius of Singapore | January 1997 on, on days when passes are allocated | | |

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|-----------------------|---------|--------------------------|-------------------------|----------------------------------|---|--|---|
| UNITED KINGDOM | ERS 1/2 | Scatterometer | Global | ERS-1 1991-1996 ERS-2 1996 on | ESA derived scatterometer winds (level 2 data) UK derived scatterometer winds (level 2 data) Raw data (level 1.5) | Algorithm: CMOD4 QC: "distance to cone"; gross error checks; "buddy checks" Publications: no | Mr. D. Offiler Meteorological Office London Road Bracknell Berkshire RG12 2SZ United Kingdom Ph: +44 (0)1344 854698 Fax: +44(0)1344 854026 Doffiler@meto.gov.uk |
| | ERS 1/2 | Altimeter | Global (no thinning) | ERS-1 1991-1996 ERS-2 1996 on | ESA derived wave height ESA derived wind speed ESA derived sea surface height Raw data: no | Algorithm : ESA QC: no Publications: no | Dr. M Holt Meteorological Office (as above) Ph: +44 (0)1344 856512 Fax: +44(0)1344 854026 mjiholt@meto.gov.uk |
| | ERS 1 | ATSR Radiometer | Global | 1991-1996 (with gaps) | 0.5° by 0.5° degree average sea surface temperature Raw data: no (RAL product only) | Algorithm : SADIST-1 QC: no Publications: no | Mr. D. Offiler Meteorological Office (as above) Ph: +44 (0)1344 854698 Fax: +44(0)1344 854026 Doffiler@meto.gov.uk |
| | ERS 1/2 | Synthetic Aperture Radar | Global | ERS-1 1991-1996 ERS-2 1996 on | ESA derived 2-D wave spectra Raw data: no (ESA product only) | Algorithm : ESA QC: no Publications: no | Mr. D. Offiler Meteorological Office (as above) Ph: +44 (0)1344 854698 Fax: +44(0)1344 854026 Doffiler@meto.gov.uk |
| UNITED STATES | GEOSAT | Altimeter | Global | March 1985 – September 1986 | Significant wave height Wind speed (two values, generated by separate algorithms) Raw data: geophysical backscatter Statistics: no | Algorithm: -wave heights: Brown model (shape of radar return) -wind speed: Chelton-Wentz - wind speed: smoothed Brown algorithm QC: some; see data CD-ROM Publications: Ref. <u>1,2,3,4</u> | Donald W. Collins NOAA National Oceanographic Data Center SSMC-3, Fourth Floor 1315 East-West Highway Silver Spring, MD USA 20910-3282 Ph: (301) 713-3277 Fax: (301) 713-3302 service@nodc.noaa.gov |

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|---|--|--------|--------------------------|---|--|---|
| SEASAT | Scatterometer Altimeter Synthetic Aperture Radar Radiometer | Global | July 1978 – October 1978 | Wind direction and speed (SASS) Wind speed and wave height (ALT) Wave spectra (1-D, 2-D) (SAR) Wind speed (SMMR) Raw data: digital and hard copy imagery from SAR Statistics: no | Algorithm: NASA JPL algorithms: sea height: AL.IG.G-01 nadir wind speed: AL.IG.G-18 QC: Scatterometer: land/water flagging; atmospheric attenuation correction Radiometer: radiometric calibration; antenna pattern correction Altimeter and SAR: N/A Raw data: blunder-point editing, timing corrections, track mode corrections, attitude and significant wave height corrections Publications: Ref. <u>5,6,7,8,9,10,11</u> | NCDC Customer Service NOAA/NCDC 151 Patton Avenue Asheville, NC USA 28801-5001 Ph: (704) 271-4800 opt 5 Fax: (704) 271-4876 dross@ncdc.noaa.gov |
| DMSP (Defence Meteorological Satellite Program) | SSM/I (special sensor microwave imager) - passive | Global | June 1987 on | Wind speed statistics Raw data: digital level 1B data (85 GHz channel N/A June 1990 – Dec. 1991) Statistics: monthly mean | Algorithm: Goodberlet et al., 1991 QC: N/A Publication: <u>15,16,17,18</u> | NCDC Climate Services NOAA/NCDC 151 Patton Avenue Asheville, NC USA 28801-5001 Ph: (704) 271-4800 opt 5 Fax: (704) 271-4876 satorder@ncdc.noaa.gov |

REFERENCES

1. Brown, S.S., H. Stanley and N. Roy, 1981. The wind speed measurement capability of spaceborne radar altimeters. IEEE J. Oceanic Eng., OE6(2), 59-63.
2. Chelton, D.B., and F.G. Wentz, 1986. Further developments of an improved altimeter wind speed algorithm. J. Geophys. Res., 91 (C12), 14250-14260.
3. Cheney, R.E., B.C. Douglas, R.A. Green, L. Miller, D.L. Porter, and N.S. Doyle, 1987. GEOSAT altimeter geophysical data record user handbook. NOAA Tech. Memo. NOS NGS-46. Washington, DC, 29 pp.
4. Dobson, E.B., J. Wilkerson, R.A. Green and B. Douglas, 1988. GEOSAT altimeter wind and wave data record user handbook. The Johns Hopkins University Applied Physics Laboratory, Laurel, MD, 28 pp.
5. SEASAT Geophysical Data Record (GDR) Users Guide Altimeter, Revision A, 1980. National Aeronautics and Space Administration, Jet Propulsion Laboratory #622-97, California Institute of Technology, Pasadena, CA
6. SEASAT SAR User's Guide to Data and Products, 1984, NOAA, National Climatic Data Center.
7. SEASAT Geophysical Data Record (GDR) Users Guide, 1982. National Aeronautics and Space Administration, Jet Propulsion Laboratory Pub. No. 622-232, California Institute of Technology, Pasadena, CA
8. SEASAT Geophysical Data Record (GDR) Users Guide, Revision A, 1982. National Aeronautics and Space Administration, Jet Propulsion Laboratory Pub. No. 622-205, California Institute of Technology, Pasadena, CA
9. Algorithm Development Facility SASS Algorithm Specifications, 1981. National Aeronautics and Space Administration, Jet Propulsion Laboratory Pub. No. 622-231, California Institute of Technology, Pasadena, CA
10. ALT Geophysical Algorithm Specifications, 1980. National Aeronautics and Space Administration, Jet Propulsion Laboratory Pub. No. 622-226, California Institute of Technology, Pasadena.
11. An Introduction to the Interim Digital SAR Processor and the Characteristics of Associated SAR Imagery, 1981. National Aeronautics and Space Administration, Jet Propulsion Laboratory Pub. No. 81-26, California Institute of Technology, Pasadena, CA
12. SEASAT-A Mission Specifications, 1977. National Aeronautics and Space Administration, Jet Propulsion Laboratory Pub. No. 622-4, California Institute of Technology, Pasadena, CA
13. Accuracy Assessment of the SEASAT Orbit and Altimeter Height Measurements, IASOM TR79-5, Univ. of Texas, Austin, TX
14. SEASAT Orbit Accuracy Assessment and Bias Calibration Workshop Report, 1980. GSFC Internal Report.
15. Goodberlet, M.A., C.T. Swift and J.C. Wilkerson, 1989. Remote sensing of ocean surface winds with the Special Sensor Microwave Imager. J. Geophys. Res., 94, 14544-14555.
16. Hollinger, J., R. Lo, G. Poe, and J. Peirce, 1987. Special Sensor Microwave/Imager User's Guide, Naval Research Laboratory, Washington, DC
17. Hollinger, J., 1989. Special Sensor Microwave/Imager Calibration/Validation. Final Report Volume I. Space Sensing Branch, Naval Research Laboratory, Washington, DC.
18. Hollinger, J., 1991. Special Sensor Microwave/Imager Calibration/Validation. Final Report Volume II. Space Sensing Branch, Naval Research Laboratory, Washington, DC.

PART II: ACCESS

| COUNTRY | INVENTORY | METADATA | COST | MEDIA; DATA VOLUME | ARRANGEMENT OF DATA | RELATED INFORMATION | ADDRESS |
|-----------------------|--------------------------|--------------------------|---------------|--|--|--|--|
| GERMANY | No | No | N/A | CD-ROM | N/A | Data archived at Federal Maritime and Hydrographic Institute in Hamburg. | Eberhard Muller Business Area Research and Development Deutscher Wetterdienst Postfach 10 04 65 63004 Offenbach Germany Ph: +49 69 8062 0 Fax: +49 69 8062 2880 |
| JAPAN | No | No | Marginal | 400 disks of MO | By synoptic time | Satellite wave data not stored in data base, but is stored on disk with other wave observations, model output and analyses | Marine Meteorological Division Climate and Marine Department Japan Meteorological Agency 1-3-4, Otemachi Chiyoda-ku Tokyo 100 Japan Ph: 81-3-3212-8341 Fax: 81-3-3211-6908 |
| SINGAPORE | Yes: www.crisp.nus.sg | Yes: www.crisp.nus.sg | See Footnote1 | CCT, exabyte, CD-ROM; quick-look images on WWW About 7100 scenes as of Dec. 9, 1996 | In time order Supplied to users in individual scenes. | Copyright protected; no further distribution by customer. | Prof. Lim Hock Centre for Remote Imaging, Sensing and Processing National University of Singapore, Kent Ridge, Singapore 119260 Republic of Singapore Ph: (65) 772 3220 Fax: (65) 775 7717 crisp@leonis.nus.sg |
| UNITED KINGDOM | No | No | N/A | N/A | N/A | UK products for internal use only ² | Mr. D. Offiler Meteorological Office London Road Bracknell Berkshire RG12 2SZ United Kingdom Ph: +44 (0)1344 854698 Fax: +44(0)1344 854026 Doffiler@meto.gov.uk |

¹ According to the prevailing international price list of authorized distributors for various regions.

² Contact Mr. Alan Terry (on +44 (0) 1344 854678) for more information

| COUNTRY | INVENTORY | METADATA | COST | MEDIA; DATA VOLUME | ARRANGEMENT OF DATA | RELATED INFORMATION | ADDRESS |
|---------------|---|--|---|--|---------------------|---|---|
| UNITED STATES | No. | Yes. http://www.nodc.noaa.gov/General/NODC-cdrom.html#geosatj3 http://www.nodc.noaa.gov/General/CDR-detdesc/geosatww.html | Various3 | CD-ROM Wind speed and wave height: 616 MB Binary geophysical data records: 4 CD-ROMs Raw data: 10 CD-ROMs | By synoptic time | GEOSAT. Non-US requests for these data must be forwarded to NOAA/NODC via the requestors embassy located in the U.S. | Donald W. Collins NOAA National Oceanographic Data Center SSMC-3, Fourth Floor 1315 East-West Highway Silver Spring, MD USA 20910-3282 Ph: (301) 713-3277 Fax: (301) 713-3302 service@nodc.noaa.gov |
| | General inventory of locations and times for which data are available. Reference 6. | Yes. References <u>12,13,14.</u> | \$100 per cartridge (currently under review). | Cartridges 27 GB | By orbit | SEASAT No restrictions on data use, further distribution. | NCDC Customer Service NOAA/NCDC 151 Patton Avenue Asheville, NC USA 28801-5001 Ph: (704) 271-4800 opt 5 Fax: (704) 271-4876 dross@ncdc.noaa.gov |
| | 3 (1) wind speed and wave height (1 CD-ROM set of GM (Geodetic Mission) reprocessed GM+ERM GDR data – | CD-ROM): \$130; (2) 6 CD-ROM set of ERM GDR (Exact Repeat Mission Geophysical Data Record) data \$38/CD-ROM or \$152/set; price not yet established. | | | | | \$28/CD-ROM or \$168/set; (3) 4 CD-ROM set of Cross-over Differences data \$22/CD-ROM or \$176/set; (5) 10 CD-ROM set of |

| COUNTRY | INVENTORY | METADATA | COST | MEDIA; DATA VOLUME | ARRANGEMENT OF DATA | RELATED INFORMATION | ADDRESS |
|---------|--|--|----------------------|---|---------------------|------------------------------|---|
| | Yes. www.saa.noaa.gov | Yes. www.saa.noaa.gov | Various ⁴ | Level 1B on IBM standard 3480 Output on 8mm, 4mm or 3480 12,000 tapes Online via ftp | By orbit | DMSP No restrictions. | NCDC Climate Services NOAA/NCDC 151 Patton Avenue Asheville, NC USA 28801-5001 Ph: (704) 271-4800 opt 5 Fax: (704) 271-4876 satorder@ncdc.noaa.gov |

⁴ Free if downloaded from Web: www.ncdc.noaa.gov/ssmi/html/ssmi.html or www.saa.noaa.gov; \$86 per output tape copy (does not include data selection). Also: www.ngdc.noaa.gov/dmsp/dmsp.html

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