

NATIONAL WEATHER SERVICE INSTRUCTION 10-806

June 24, 2010

Operations and Services

Aviation Weather Services, NWSPD 10-8

WORLD AREA FORECAST SYSTEM

NOTICE: This publication is available at: <http://www.nws.noaa.gov/directives/>.

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Extensive revision to bring the directive into agreement with Annex 3 of *Meteorological Service for International Air Navigation* from International Civil Aviation Organization (ICAO), 16th edition.

//Signed//

June 10, 2010

David B. Caldwell

Date

Director, Office of Climate, Water, and Weather Services

<u>Table of Contents</u>	<u>Page</u>
1. Purpose.....	2
2. General.....	2
3. World Area Forecast System and World Area Forecast Centers (WAFC).....	2
4. World Area Forecast System Information.....	3
4.1 Grid Point Data Forecasts.....	3
4.2 Significant Weather (SIGWX) Forecasts.....	3
4.2.1 High and Medium Level SIGWX Forecasts.....	4
4.2.2 Criteria for Including Items in SIGWX.....	5
4.3 SIGWX Text Corrections.....	5
4.3.1 SIGWX Text Correction Bulletin Information.....	6
4.3.2 Correction Message Template.....	6
5. WAFC Back-up.....	6
5.1 WAFC Washington interruptions.....	6
5.2 Failure of Primary Operational Workstation.....	6
5.3 WAFC Washington message switching interruptions.....	7
5.4 Complete Outage at WAFC Washington.....	7
6. WAFS International Satellite Communications System (ISCS) Broadcasts.....	7
7. Retention of Weather Documentation Materials.....	7

Appendices

A. SIGWX Areas of Coverage – Chart Form.....	8
B. SIGWX Text Correction Product Examples.....	11
C. Footprints of WAFC Washington Satellite Broadcasts.....	13

1. Purpose. This instruction describes the World Area Forecast System (WAFS) and operational procedures and services provided by the Washington World Area Forecast Center (WAFC) in support of WAFS.

2. General. The WAFS was established in 1982 by the International Civil Aviation Organization (ICAO) Communications/Meteorology (COM/MET) Divisional Meeting held conjointly with the seventh session of the World Meteorological Organization (WMO) Commission for Aeronautical Meteorology (CAeM) in Montreal.

The Federal Aviation Administration (FAA) is the meteorological authority, as defined by ICAO, for the United States and has agreed to provide a WAFC within the WAFS framework. The FAA designated the National Weather Service (NWS) as the meteorological provider with responsibility for the WAFS broadcast. The Washington WAFC became operational in 1996.

3. World Area Forecast System and World Area Forecast Centers. The WAFS is defined in ICAO Annex 3, *Meteorological Service for International Air Navigation*, as “...a worldwide system by which world area forecast centers provide aeronautical meteorological en-route forecasts in uniform standardized formats.” A WAFC is “...a meteorological center designated to prepare and issue significant weather forecasts and upper-air forecasts in digital

form on a global basis.” The two ICAO-sponsored WAFCs are provided by the United States and United Kingdom and are referred to as the Washington WAFC and the London WAFC respectively.

The Washington WAFC is composed of three components of the National Centers for Environmental Prediction (NCEP): the Aviation Weather Center (AWC) in Kansas City, Missouri; the NCEP Central Operations (NCO) in Camp Springs, Maryland; and the Telecommunications Operations Center (TOC) at NWS Headquarters in Silver Spring, Maryland.

4. World Area Forecast System Information. WAFS information is provided to users as specified in ICAO Annex 3 through WAFS broadcasts. WAFS information includes global grid point forecasts and significant weather forecast products.

4.1 Grid Point Data Forecasts. WAFCs will prepare global grid point forecasts four times a day. Forecasts will be valid for fixed valid times at 6hours, 12h, 18h, 24h, 30h and 36h after the time of the synoptic data on which the forecasts were based (0000, 0600, 1200 and 1800 UTC). The dissemination of each forecast should be in the above order and be completed as soon as technically feasible but not later than 6 hours after standard observation time for the following elements:

- a. Upper wind, upper-air temperature data for flight levels 50 (850 hPa), 100 (700 hPa), 140 (600 hPa), 180 (500 hPa), 240 (400 hPa), 300 (300 hPa), 340 (250 hPa), 390 (200 hPa), 450 (150 hPa), and 530 (100 hPa);
- b. Flight level and temperature of tropopause;
- c. Direction, speed and flight level of maximum wind;
- d. Humidity data for flight levels 50 (850 hPa), 100 (700 hPa), 140 (600 hPa) and 180 (500 hPa); and
- e. Geopotential altitude data for flight levels 50 (850 hPa), 100 (700 hPa), 140 (600 hPa), 180 (500 hPa), 240 (400 hPa), 300 (300 hPa), 340 (250 hPa), 390 (200 hPa) and 450 (150 hPa).

The grid point data above will be issued in GRIB code form, as prescribed by the WMO, in a fixed grid with a horizontal resolution of 140 km.

Note.— The GRIB code form is contained in WMO Publication No. 306, Manual on Codes, Volume I.2, Part B —Binary Codes.

Note.— 140 km represents a distance of about 1.25° of latitude.

4.2 Significant Weather (SIGWX) Forecasts. WAFCs will prepare significant weather (SIGWX) global forecasts four times a day. Forecasts will be valid for fixed valid times at 30

hours after the time of the synoptic data on which the forecasts were based (0000, 0600, 1200 and 1800 UTC). The dissemination of SIGWX forecasts will be completed as soon as technically feasible but no later than 17 hours after the forecast valid time. SIGWX forecasts will be issued in the BUFR code form as prescribed by the World Meteorological Organization (WMO). *Note: The BUFR code form is contained in WMO Publication No. 306, Manual on Codes, Volume I.2, Part B – Binary Codes.*

SIGWX forecasts will be issued as:

- a. high-level SIGWX forecasts for flight levels between 250 and 630; and
- b. medium-level SIGWX forecasts for flight levels between 100 and 450 for limited geographical areas, as determined by regional air navigation agreement.

4.2.1 High- and Medium-Level SIGWX Forecasts. SIGWX forecasts for high and medium-levels will include the following elements:

- a. Information from Tropical Cyclone Advisory Centers (TCACs) on significant tropical cyclones provided the maximum of the 10-minute mean surface wind speed is expected to reach or exceed 34 knots;
- b. Severe squall lines;
- c. Moderate or severe turbulence (in cloud or clear air);
- d. Moderate or severe icing;
- e. Widespread sandstorm/duststorm;
- f. Cumulonimbus clouds associated with thunderstorms and with a) to e);
- g. Flight level of tropopause;
- h. Jet streams;
- i. Information from Volcanic Ash Advisory Centers (VAACs) on the location of volcanic eruptions producing ash clouds of significance to aircraft operations comprising: volcanic eruption symbol at the location of the volcano and, at the side of the chart, the volcano eruption symbol, the name of the volcano, latitude/longitude, the date and time of first eruption, if known, and a reference to SIGMET and NOTAM or ASHTAM issued for the area concerned; and
- j. Information from WMO Regional Specialized Meteorological Centers (RSMCs) on the location of an accidental release of radioactive materials into the atmosphere, of significance to aircraft operations, comprising: the radioactivity symbol at the site of the accident and, at the side of the chart, the radioactivity

symbol, latitude/longitude of the site of the accident, date and time of the accident and a reminder to users to check NOTAM for the area concerned.

4.2.2 Criteria for including items in SIGWX forecasts. The following criteria should be applied for high-level and medium-level SIGWX forecasts. Elements in a) through d) below should only be included if expected to occur between the lower- and upper-level boundaries of the SIGWX forecast.

- a. The abbreviation “CB” should only be included when it refers to the occurrence or expected occurrence of cumulonimbus clouds:
 - 1) Affecting an area with a maximum spatial coverage of 50 percent or more of the area concerned;
 - 2) Along a line with little or no space between individual clouds; or
 - 3) Embedded in cloud layers or concealed by haze.
- b. The inclusion of “CB” should be understood to include all weather phenomena normally associated with cumulonimbus clouds, i.e. thunderstorm, moderate or severe icing, moderate or severe turbulence and hail;
- c. Where a volcanic eruption or an accidental release of radioactive materials into the atmosphere warrants the inclusion of the volcanic activity symbol or the radioactivity symbol in SIGWX forecasts, the symbols should be included on high-level and medium-level SIGWX forecasts regardless of the height to which the ash column or radioactive material is reported or expected to reach; and
- d. In the case of co-incident or the partial overlapping of items a), i) and j) in 4.2.1, the highest priority should be given to item i), followed by item j) and a). The item with the highest priority should be placed at the location of the event, and an arrow should be used to link the location of the other item(s) to its associated symbol or text box.

Note: The explanations for the abbreviations can be found in the Procedures for Air Navigation Services — ICAO Abbreviations and Codes (PANS-ABC, Doc 8400).

4.3 SIGWX Text Corrections. In September 2009, the 5th meeting of the ICAO WAFS Operations Group (WAFSOPSG/5), the WAFCs were asked to implement a text correction product to address errors in the most recently issued SIGWX forecasts in the BUFR and/or PNG formats. The SIGWX text correction product would be an administrative message, drawing user’s attention to the error.

4.3.1 SIGWX Text Correction Bulletin Information.

WAFC Washington WMO Header: **FXUS65 KKCI**

WAFC London WMO Header: FXUK65 EGRR

4.3.2 Correction Message Template. General Correction Message Template:

FXUS65 KKCI [DDHHMM]

WAFC WASHINGTON HAS IDENTIFIED AN ERROR WITH THE FOLLOWING WAF
SIGWX BULLETIN[S] VALID AT [DDHH00] UTC

[TTAAii CC DDHHMM]

USERS ARE ADVISED THAT [...*FREE TEXT**....]

WAFC WASHINGTON WILL NOT RE-TRANSMIT BUFR OR PNG SIGWX PRODUCTS.

ISSUED BY WAFC WASHINGTON

Examples of the SIGWX Text Correction Product can be found in Appendix B.

5. Back-up. In case of interruption of WAFC operations, its functions will be carried out by the other WAFC, including the production and dissemination of all of the WAFC products and services.

5.1 WAFC Washington interruptions. A global spectral model runs at the National Centers for Environmental Prediction (NCEP) and produces the WAFC Washington Numerical Weather Prediction (NWP) output. This forms the basis for the wind and temperature forecasts in the GRIB code form. NCEP maintains the ability to run the global model on redundant systems in the case of a failure of the primary system.

If the NWP is significantly delayed or missing due to the failure of the primary or secondary computer systems, a decision is made to use the NCEP NWP data from the last good run incremented forwards by the appropriate number of hours, or use NWP data routinely received from WAFC London at the National Weather Service Telecommunications Gateway (NWSTG) to produce the WAFS forecasts

5.2 Failure of Primary Operational Workstation. If the primary operational workstation fails, the forecaster would use a back-up workstation located on the forecast floor. If the WAFC Washington SIGWX production centre is out, WAFC London is called on to produce all of the WAFC Washington SIGWX forecasts. These forecasts are then switched back to the NWSTG with the routine WAFC London SIGWX forecasts for dissemination via the International Satellite Communication System (ISCS).

5.3 WAFC Washington message switching interruptions. An integrated services digital network (ISDN) circuit is maintained between WAFC London and the ISCS uplink site. In the rare event that the message switch at the NWSTG is out WAFC London would be notified to begin sending WAFS products on the ISDN circuit directly to the ISCS uplink site. The ISCS satellites then broadcast these products normally.

5.4 Complete Outage at WAFC Washington. The WAFS product generation facilities are located at multiple sites. Thus, it is highly unlikely that WAFC Washington would ever be completely out. The back-up procedures carried out would depend on the facility affected, and have been described above. Two independent data paths exist from the message-switching centre. Thus, a cable cut would not disrupt communications to or from the switch. However, in a scenario where the Washington message switch is completely out, the distribution of products to WAFC London and to the ISCS is also severed.

The complete WAFC back-up procedures can be found at <http://www.icao.int/anb/wafsopsg/backup.pdf>.

6. WAFS International Satellite Communications System (ISCS) Broadcasts. The ISCS is a satellite data distribution system operated by the NWS, providing support to the WAFS and the WMO Region IV Meteorological Telecommunications Network (RMTN). Approved users within the satellite coverage areas (footprints) are able to receive WAFS/ISCS products. ISCS/WAFS is a point-to-multi-point delivery system serving as an additive component to the Aeronautical Fixed Telecommunication Network (AFTN). The system does not replace data acquisition and distribution functions of the ICAO/AFTN. The ISCS satellite coverage areas are shown in Appendix B. The remainder of world coverage is supported by the WAFS Satellite Distribution (SADIS) broadcast provided by the United Kingdom.

7. Retention of Weather Documentation Materials. In accordance with NWSI 10-2003, Records Retention, NWS forecast products will be electronically transferred to the National Climatic Data Center (NCDC) to meet retention requirements (five years). A limited short-term records retention responsibility resides at the originating NWS office. Each originating office will be able to electronically retrieve and print hard copies of their forecast products issued within the first 14 days of issuance. Offices should use caution in distributing copies of these records. However, if copies are distributed, a disclaimer indicating the records are not certified should be provided, along with contact information on how to obtain certified copies from NCDC.

Appendix A - Fixed areas of coverage of WAFS forecasts in chart form

1. Mercator Projection

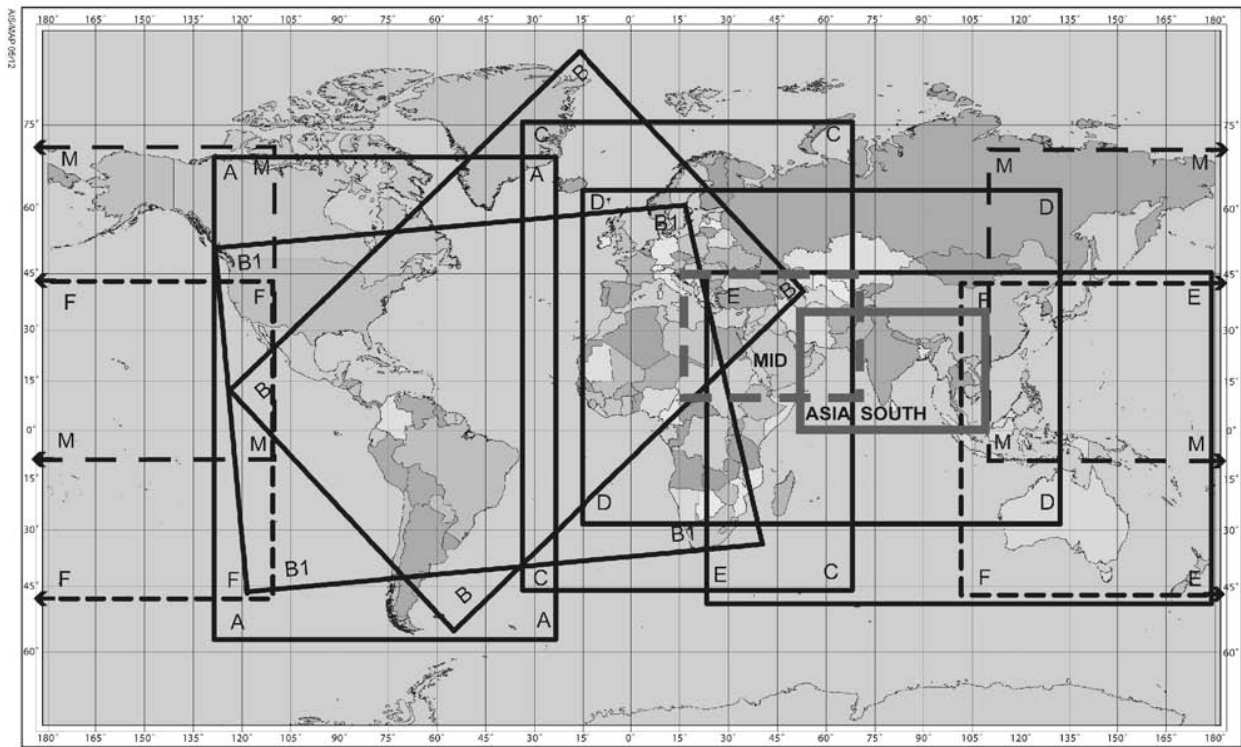


CHART	LATITUDE	LONGITUDE	CHART	LATITUDE	LONGITUDE
A	N7000	W12500	D	N6500	W01500
A	N7000	W02500	D	N6500	E13200
A	S5500	W02500	D	S2800	E13200
A	S5500	W12500	D	S2800	W01500
ASIA	N3600	E05300	E	N4500	E02500
ASIA	N3600	E10800	E	N4500	E18000
ASIA	0000	E10800	E	S4700	E18000
ASIA	0000	E05300	E	S4700	E02500
B	N8500	W01500	F	N4230	W11000
B	N4330	E05300	F	S4730	W11000
B	S5200	W05000	F	S4730	E10000
B	N1500	W12500	F	N4230	E10000
B1	N5000	W12800	M	S1000	E11000
B1	N6000	E01500	M	N7200	E11000
B1	S3500	E04000	M	N7200	W11000
B1	S4600	W10800	M	S1000	W11000
C	N7600	W03230	MID	N4400	E01700
C	N7600	E07000	MID	N4400	E07000
C	S4500	E07000	MID	N1000	E07000
C	S4500	W03230	MID	N1000	E01700

Figure A-1. Fixed areas of coverage of WAFS forecasts in chart form – Mercator projection

2. Polar Stereographic – Northern Hemisphere

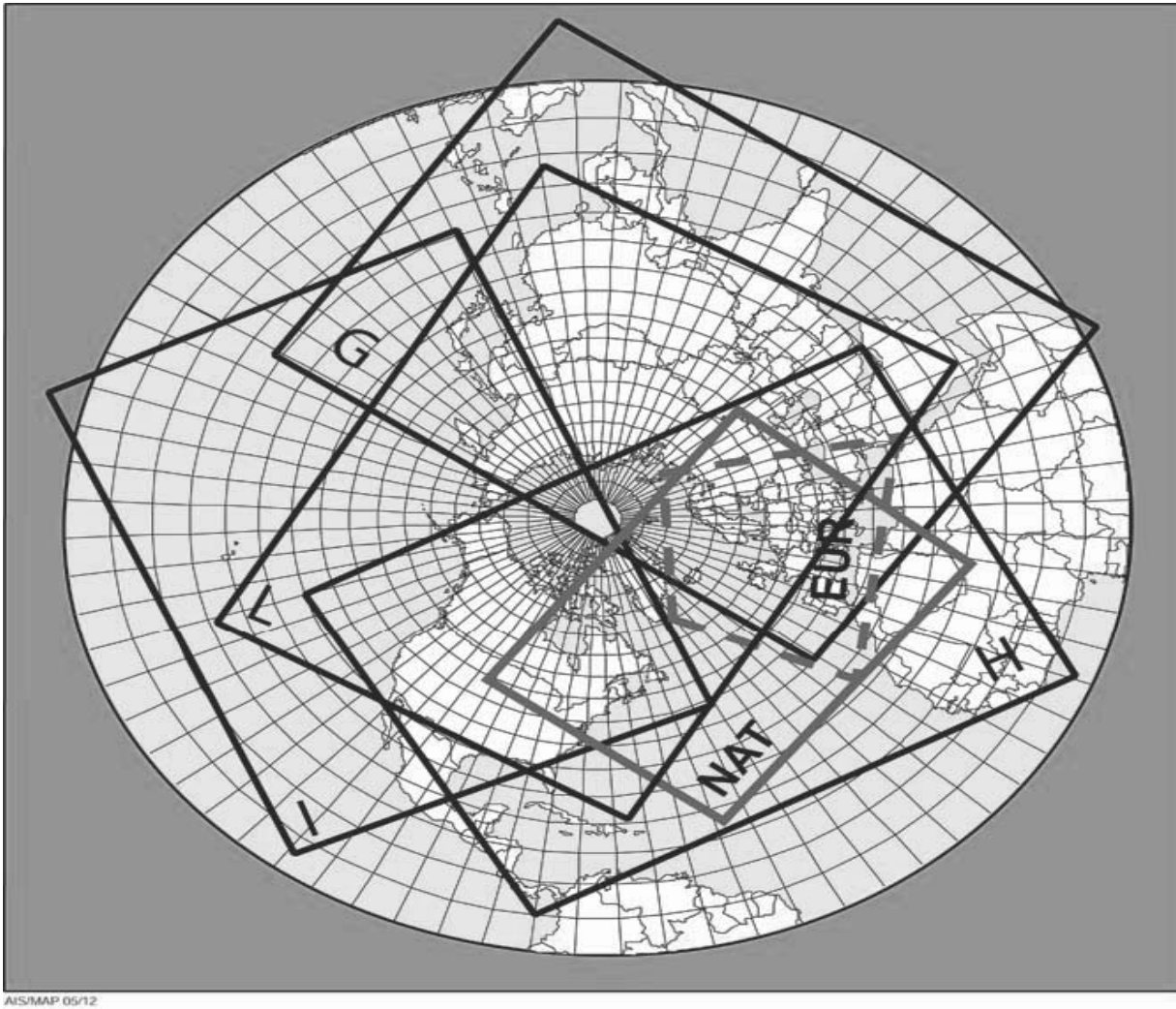
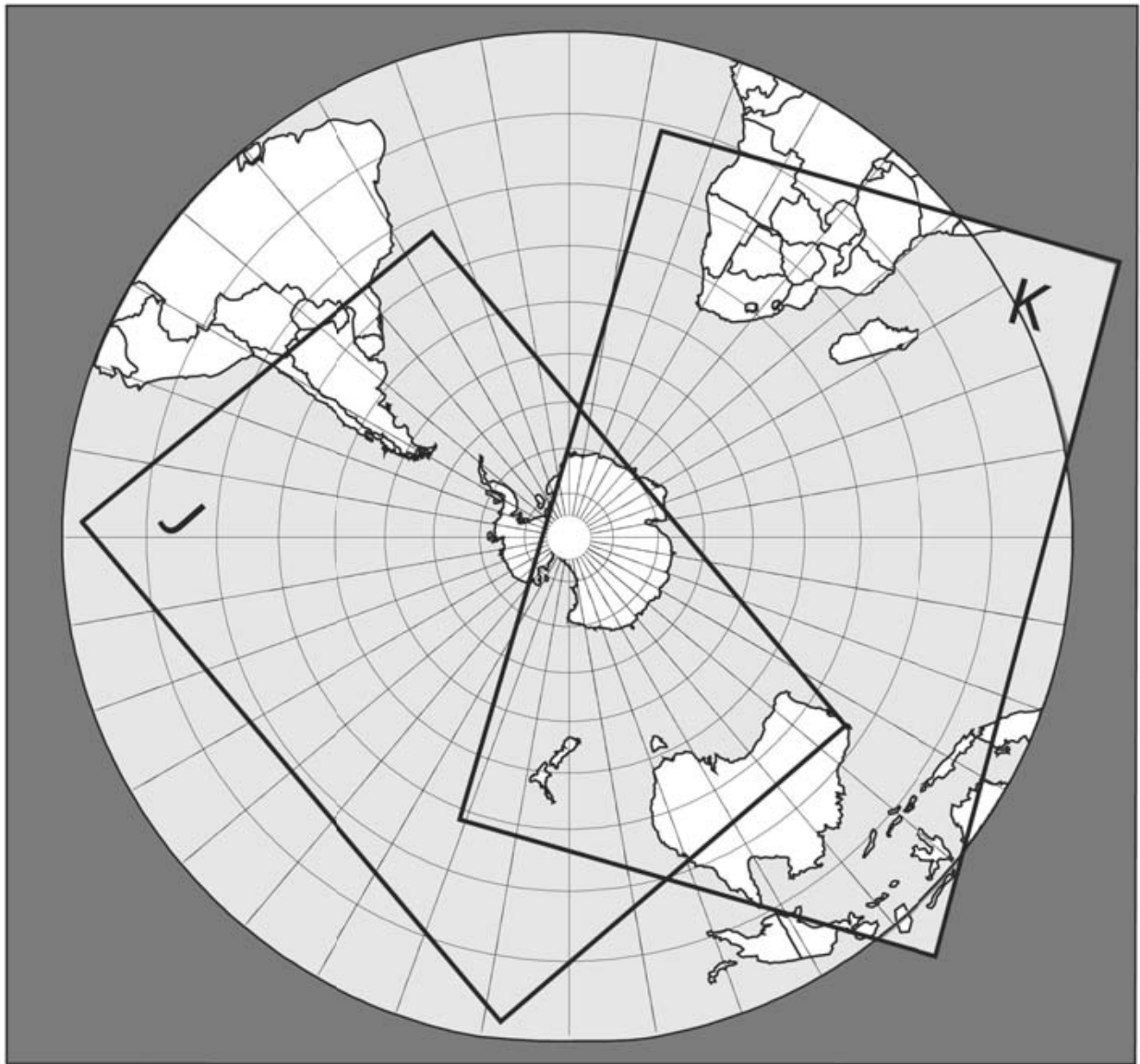


CHART	LATITUDE	LONGITUDE	CHART	LATITUDE	LONGITUDE
EUR	N5830	E06800	I	N0200	W11000
EUR	N2600	E03145	I	N4000	W03953
EUR	N2100	W02130	I	N2000	E13000
EUR	N4700	W05800	I	S0500	E18000
G	S1000	E11000	L	N1205	E11449
G	S0530	E04515	L	N1518	E4500
G	N3500	W02000	L	N2020	E6900
G	N2000	E16500	L	N1413	E14338
H	N0230	W00500	NAT	N4454	W10130
H	N2500	E05600	NAT	N1953	E00945
H	N3000	W14500	NAT	N1721	W05354
H	N0500	W08000	NAT	N5047	E06004

Figure A-2. Fixed areas of coverage of WAFS forecasts in chart form – Polar stereographic projection (northern hemisphere)

3. Polar Stereographic – Southern Hemisphere



AIS/MAP 05/12

CHART	LATITUDE	LONGITUDE
J	S2305	W03700
J	S2245	E11322
J	S0616	E17245
J	S0722	W09347
K	S1000	E00500
K	S2845	W16730
K	N0500	E12800
K	N1200	E05500

Figure A-3. Fixed areas of coverage of WAFS forecasts in chart form – Polar stereographic projection (southern hemisphere)

Appendix B - SIGWX Text Correction Samples

1. CAT label is missing on either the PNG or BUFR files

FXUS65 KKCI 241630

WAFC WASHINGTON HAS IDENTIFIED AN ERROR WITH THE FOLLOWING WAFC SIGWX BULLETIN VALID AT 251200 UTC

BUFR FILE: JUCE00 KKCI

PNG CHARTS:

ICAO AREA M: PGDE29 KKCI

ICAO AREA F: PGGE05 KKCI

ICAO AREA I: PGBE05 KKCI

A MISSING CAT LABEL WAS DISCOVERED ON BUFR FILE: JUCE00 KKCI; AND

PNG CHARTS:

ICAO AREA M: PGDE29 KKCI

ICAO AREA F: PGGE05 KKCI

ICAO AREA I: PGBE05 KKCI

THE CAT LABEL SHOULD BE LOCATED NEAR 3500N14500E.

CAT INTENSITY: MODERATE.

CAT LEVELS: 380/300.

WAFC WASHINGTON WILL NOT RE-TRANSMIT BUFR OR PNG SIGWX PRODUCTS.

ISSUED BY WAFC WASHINGTON

2. A tropical cyclone symbol is depicted but it is missing a label on either the PNG or BUFR files

FXUS65 KKCI 241630

WAFC WASHINGTON HAS IDENTIFIED AN ERROR WITH THE FOLLOWING WAFC SIGWX BULLETIN VALID AT 251200 UTC

BUFR FILE: JUVE00 KKCI

PNG CHARTS:

ICAO AREA M: PGDE29 KKCI

ICAO AREA F: PGGE05 KKCI

ICAO AREA I: PGBE05 KKCI

A MISSING TROPICAL CYCLONE LABEL WAS DISCOVERED ON

BUFR FILE: JUVE00 KKCI AND

PNG CHARTS:

ICAO AREA M: PGDE29 KKCI
ICAO AREA F: PGGE05 KKCI
ICAO AREA I: PGBE05 KKCI

*A TROPICAL CYCLONE LABEL SHOULD BE LOCATED NEAR 3120N13005E FOR
TROPICAL CYCLONE: CHATAAN*

WAFC WASHINGTON WILL NOT RE-TRANSMIT BUFR OR PNG SIGWX PRODUCTS.

ISSUED BY WAFC WASHINGTON

3. Erroneous volcano either on the PNG or BUFR files

FXUS65 KKCI 241330

WAFC WASHINGTON HAS IDENTIFIED AN ERROR WITH THE FOLLOWING WAFC
SIGWX BULLETIN VALID AT 250600 UTC

BUFR FILE: JUVE00 KKCI

USERS ARE ADVISED THAT AN *ERRONEOUS VOLCANO* WAS DISCOVERED ON BUFR
FILE(S) *JUVE00 KKCI*

THE *VOLCANO MAYON LOCATED NEAR 1324N12342E* SHOULD BE DELETED.

WAFC WASHINGTON WILL NOT RE-TRANSMIT BUFR OR PNG SIGWX PRODUCTS.

ISSUED BY WAFC WASHINGTON

Appendix C – Footprints of WAFC Washington Satellite Broadcasts

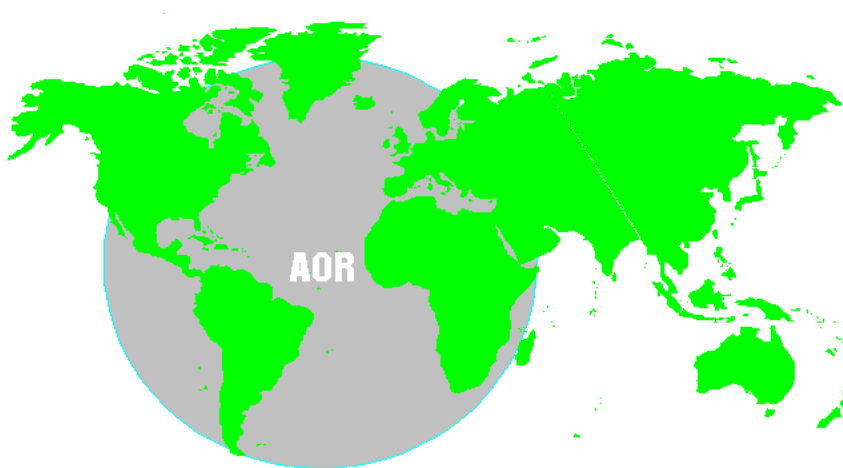
**U.S. National Weather Service
International Satellite Communications System**



approximately 105 E to 110 W

Pacific Intelsat Coverage

**U.S. National Weather Service
International Satellite Communications System**



Approximately 110 W to 60 E

Atlantic Intelsat Coverage