



**GSE – PROMOTE 2**  
**C6 Validation Report**

REF : PROMOTE 2 C6  
ISSUE : 1.0  
DATE : 14.05.2007  
PAGE : 1

DOSSIER: COMMON

TASK: -2-



TITLE:

**GMES SERVICE ELEMENT**  
**PROMOTE 2**  
**C6 Validation Report**  
**UV FORECAST FOR GREENLAND**  
**Version 2**



**GSE – PROMOTE 2**  
**C6 Validation Report**

REF : PROMOTE 2 C6  
ISSUE : 1.0  
DATE : 14.05.2007  
PAGE : II

## DOCUMENT STATUS SHEET

|                      | FUNCTION                            | NAME                        | DATE | SIGNATURE |
|----------------------|-------------------------------------|-----------------------------|------|-----------|
| LEAD AUTHORS         | editor                              | R. Delgado<br>J. C. Lambert |      |           |
| CONTRIBUTING AUTHORS | Service leader<br>Service providers | H. Jonch-Sorensen           |      |           |
| REVIEWED BY          | Reviewers                           |                             |      |           |
| APPROVED BY          | Technical officer (ESA)             |                             |      |           |
| ISSUED BY            | Project manager                     |                             |      |           |

|   |  |  |
|---|--|--|
|  | <b>GSE - PROMOTE 2</b><br><b>C6 Validation Report</b><br><b>UV Index for Greenland</b> | REF: PROMOTE-2 C6<br>ISSUE: 1.2<br>DATE: 09.07.2008<br>PAGE: |
|---|--|--|

## DOCUMENT CHANGE RECORD

| Issue            | Date       | Modified Items / Reason for Change          |
|------------------|------------|---|
| <b>Version 1</b> |            |   |
| N/A              |            |   |
| <b>Version 2</b> |            |   |
| 1.01             | 01/04/2008 | Template with draft validation plan created |
| 1.1              | 30/05/2008 | Template updated and distributed            |
| 1.2              | 02/07/2008 | Template updated and distributed            |
| 1.3              | 09/07/2008 | Second iteration completed                  |
| 1.5              | 11/07/2008 | Document ready for final review             |

|   |  |  |
|---|--|--|
|  | <p align="center"><b>GSE - PROMOTE 2</b></p> <p align="center"><b>C6 Validation Report</b></p> <p align="center"><b>UV Index for Greenland</b></p> | <p>REF: PROMOTE-2 C6<br/> ISSUE: 1.0<br/> DATE: 09.07.2008<br/> PAGE: IV</p> |
|---|--|--|

## LIST OF TABLES

|  |    |
|--|----|
| Table -1 Product characterization.....   | 3  |
| Table -2 Description of datasets used for validation .....   | 4  |
| Table -3 Data quality and validation of individual components .....  | 5  |
| Table -4 Validation against specifications and against user requirements for UV Clear Sky Index<br>Forecast .....  | 7  |
| Table -5 Validation against specifications and against user requirements for Cloud Cover Corrected<br>UV Index Forecast.....                             | 8  |
| Table -6 Validation against specifications and against user requirements for Time series of UV index<br>and total ozone.....                             | 10 |
| Table -7 Validation against specifications and against user requirements for Spring time warning.....  | 12 |
| Table -8 Validation of quality assessment and control procedures for Clear and cloud corrected Sky UV<br>Index Forecast and Spring time UV Warning ..... | 14 |
| Table -9 Validation of quality assessment and control procedures for time series of UV index and<br>Ozone.....   | 16 |

|   |   |  |
|---|---|--|
|  <p><b>PROMOTE</b></p> | <p><b>GSE - PROMOTE 2</b><br/>C6 Validation Report<br/>UV Index for Greenland</p> | <p>REF: PROMOTE-2 C6<br/>ISSUE: 1.0<br/>DATE: 09.07.2008<br/>PAGE: V</p> |
|---|---|--|

## LIST OF FIGURES

Figure -1 Position of the UV Forecast for Greenland service within PROMOTE 2 UV Services..... 1

|   |  |  |
|---|--|--|
|  | <p align="center"><b>GSE - PROMOTE 2</b></p> <p align="center"><b>C6 Validation Report</b></p> <p align="center"><b>UV Index for Greenland</b></p> | <p>REF: PROMOTE-2 C6<br/> ISSUE: 1.0<br/> DATE: 09.07.2008<br/> PAGE: VI</p> |
|---|--|--|

## LIST OF ACRONYMS

|           |   |
|-----------|---|
| EUVDB     | European UV Database  |
| WOUDC     | World Ozone and Ultraviolet Radiation Data Centre                                 |
| NSF       | National Science Foundation   |
| UVI       | UV Index  |
| FMI       | Finnish Meteorological Institute  |
| UV        | Ultraviolet   |
| CIE       | Commission International de l'Eclairage, International Commission on Illumination |
| PNG       | Portable Network Graphics   |
| OMI       | Ozone Monitoring Instrument   |
| TOMS      | Total Ozone Mapping Spectrometer  |
| GOME      | Global Ozone Monitoring Experiment  |
| SCIAMACHY | Scanning Imaging Absorption Spectrometer for Atmospheric ChartographY             |

|      |                |
|------|----------------|
| N/A  | Not Available  |
| n.a. | not applicable |
| n.s. | not specified  |

|   |  |   |
|---|--|---|
|  | <p align="center"><b>GSE - PROMOTE 2</b></p> <p align="center"><b>C6 Validation Report</b></p> <p align="center"><b>UV Index for Greenland</b></p> | <p>REF: PROMOTE-2 C6<br/> ISSUE: 1.0<br/> DATE: 09.07.2008<br/> PAGE: VII</p> |
|---|--|---|

**TABLE OF CONTENTS**

**DOCUMENT STATUS SHEET ..... II**

**DOCUMENT CHANGE RECORD .....III**

**LIST OF TABLES.....IV**

**LIST OF FIGURES..... 5**

**LIST OF ACRONYMS..... 6**

**1 UV FORECAST FOR GREENLAND ..... 1**

1.1 Service Summary ..... 1

1.2 Product Characterization ..... 2

1.3 Validation plan and validation data..... 3

1.4 Validation of individual components ..... 5

1.5 Validation against specifications and against user requirements ..... 6

1.5.1 Clear Sky UV Index Forecast ..... 6

1.5.2 Cloud Cover Corrected UV Index Forecast ..... 7

1.5.3 Time Series of UV Index and Ozone ..... 9

1.5.4 Spring time UV warning ..... 11

1.6 Quality assessment and control procedures: Service quality ..... 13

1.6.1 Clear and cloud corrected Sky UV Index Forecast and Spring time UV Warning..... 13

1.6.2 Time series of UV index and ozone..... 15

1.7 References ..... 16

1.7.1 Electronic references and online data access paths ..... 16

1.7.2 Bibliographic references ..... 16



**GSE - PROMOTE 2**

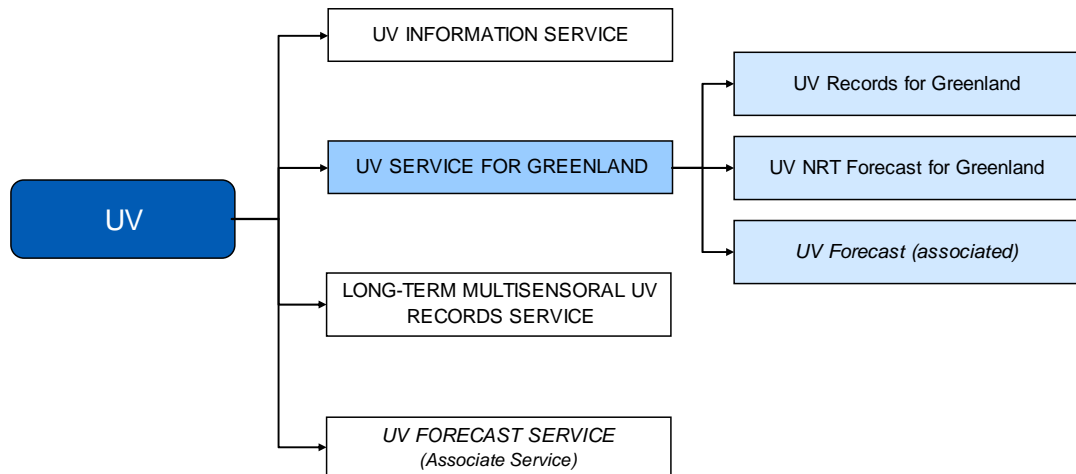
**C6 Validation Report  
UV Index for Greenland**

REF: PROMOTE-2 C6  
ISSUE: 1.0  
DATE: 09.07.2008  
PAGE: VIII

<PAGE INTENTIONALLY LEFT BLANK>

# 1 UV FORECAST FOR GREENLAND

## 1.1 Service Summary



**Figure -1 Position of the UV Forecast for Greenland service within PROMOTE 2 UV Services.**

The UV service for Greenland delivers forecasts of UV-index for Greenland in the period from March to October. The UV-index is valid for local noon (maximum solar elevation) and clear sky conditions and is thus the maximum UV-index obtainable on a given day. During 2008 an UV index forecast including correction for expected cloud cover will be included in the service.

The service will also provide presentation of time series of UV- and Ozone measurements from six locations in Greenland.

**Service is/will be operational since/after: March 2008**

**Research partners: ASIAQ**

**Provider(s): DMI (Denmark)**

**Validation contact: H. Jonch-Sorensen, hjs@dmj.dk**

|   |  |  |
|---|--|--|
|  | <b>GSE - PROMOTE 2</b><br><b>C6 Validation Report</b><br><b>UV Index for Greenland</b> | REF: PROMOTE-2 C6<br>ISSUE: 1.0<br>DATE: 09/07/2008<br>PAGE: 2 of 16 |
|---|--|--|

## 1.2 Product Characterization

|   |  |
|---|--|
| <b>Sub-service/Product</b>  |  |
| <b>Clear Sky UV index</b>   |  |
| Parameter [give name]   | UV index                                     |
| Typical range   | 0 - 9  |
| Determination of the typical range (Method, criteria)               | Calculated on the basis of ozone climatology |
| Maximum range [New!]  | 0 - 15                                       |
| &e2   | dex  |
| <i>Standards</i>  | WMO/WHO                                      |
| <b>Cloud Cover corrected UV index</b>                               |  |
| Parameter [give name]   | UV index                                     |
| Typical range   | 0 - 9  |
| Determination of the typical range (Method, criteria)               | Calculated on the basis of ozone climatology |
| Maximum range [New!]  | 0 - 15                                       |
| Units   | dex  |
| <b>Spring time UV warning</b>                                       |  |
| Parameter [give name]   | UV index                                     |
| Typical range   | 0 - 9  |
| Determination of the typical range (Method, criteria)               | Calculated on the basis of ozone climatology |
| Maximum range [New!]  | 0 - 15                                       |
| Units   | dex  |
| <b>Time series of UV and Ozone</b>                                  |  |
| Parameter [give name]UV index and Total ozone                       |  |
| Typical range0-9 and 200-500  |  |
| Determination of the typical range (Method, criteria)experience (?) |  |

|   |  |  |
|---|--|--|
|  | <b>GSE - PROMOTE 2</b><br><b>C6 Validation Report</b><br><b>UV Index for Greenland</b> | REF: PROMOTE-2 C6<br>ISSUE: 1.0<br>DATE: 09/07/2008<br>PAGE: 3 of 16 |
|---|--|--|

|                                      |
|--------------------------------------|
| Maximum range [New!]0-15 and 150-550 |
| Units dex and Dobson Unit            |
| <i>Standards-</i>                    |

**Table -1Product characterization**

### 1.3 Validation plan and validation data

The UV index forecast for Greenland shall be validated against available ground based UV measurements. The service provider (DMI) and the sub-contractor (ASIAQ) can at present provide these measurements from 6 locations in Greenland and in near future a new instrument will be in operation. Furthermore, the NSF data base includes UV measurements from the Summit station.

The first validation will be on the clear sky UV index product. Measurements from the ground based locations under clear sky conditions will be compared to the forecasted UV index and the results will be available on the web page.

Since meteorological observations may not always be available, clear sky measurements can be selected in the 5 minutes average measurements by a procedure developed for this project. The deviation between forecast and measured clear sky UV index will be calculated and presented for all stations in the delivery period, March – October. The quality of the 5 day forecast will be evaluated in the same manner.

During Phase 2 the cloud cover corrected UV index forecast shall be implemented and validated using measurements from the above mentioned stations.

Finally the input total ozone (SCIAMACHY) used for calculating the UV-index shall be compared with ground based observations available from the two DMI stations in Greenland.

| <b>VALIDATION DATA</b>            |   |
|-----------------------------------|---|
| <b>Ground based observations</b>  |   |
| Name UV-index<br>ASIAQ<br>Phase 2 | <i>Data availability and:</i> Data are available directly from ASIAQ after a quality assurance procedure, monthly delivery<br><br><i>Spatial coverage and resolution:</i> Populated areas on the east coast of Greenland.<br><br><i>Temporal coverage and resolution:</i> In the sun light period from March-October, 5 minutes average measurements.<br><br><i>Location(s) (coordinates):</i> Narsaq (46W, 57N), Uummanaq (52W, 41N), Qeqertarsuaq (53W, 69N), Nuuk (51W, 64N)<br><br><i>Uncertainty quantification (e.g. Accuracy):</i> N/A |
| Name UV-index<br>DMI              | <i>Data availability and access:</i> Data are available directly from DMI after a quality assurance procedure, monthly delivery   |

|   |  |   |
|---|--|---|
|  | <p align="center"><b>GSE - PROMOTE 2</b></p> <p align="center"><b>C6 Validation Report</b></p> <p align="center"><b>UV Index for Greenland</b></p> | <p>REF: PROMOTE-2 C6<br/> ISSUE: 1.0<br/> DATE: 09/07/2008<br/> PAGE: 4 of 16</p> |
|---|--|---|

|  |   |
|--|---|
| <p>Phase 2</p>                                 | <p><i>Spatial coverage and resolution:</i> Two sites in Greenland</p> <p><i>Temporal coverage and resolution:</i> In the sun light period from March-October, 5 minutes average measurements.</p> <p><i>Location(s) (coordinates):</i> Pittufik (69W, 77N) , Kangerlussuaq (51W, 67N)</p> <p><i>Uncertainty quantification (e.g. Accuracy):</i> N/A</p> |
| <p><b><i>In-situ observations n.a.</i></b></p> |   |
| <p><b>EO Data    n.a.</b></p>                  |   |

**Table -2 Description of datasets used for validation**

|   |  |  |
|---|--|--|
|  | <p align="center"><b>GSE - PROMOTE 2</b><br/> <b>C6 Validation Report</b><br/> <b>UV Index for Greenland</b></p> | REF: PROMOTE-2 C6<br>ISSUE: 1.0<br>DATE: 09/07/2008<br>PAGE: 5 of 16 |
|---|--|--|

## 1.4 Validation of individual components

The UV index (clear sky and cloud cover corrected) is validated against the ground based data mentioned in Table 2. For each day the difference between predicted and measured value is calculated and the mean difference (bias) and r.m.s for the whole validation period is calculated.

| <b>VALIDATION OF INDIVIDUAL COMPONENTS</b> |  |
|--|--|
| <b>Uncertainty assessment</b>              |  |
| Bias                                       | $\sum(UV_{observed} - UV_{forecast})/N$ and<br>$\sum((UV_{observed} - UV_{forecast})/UV_{forecast}) / N$   |
| RMS  |  |
| On-time delivery factor                    | Number of on-time delivery/Number of days  |
| Input file format                          | Full grid covering Greenland, correct date and longitude, latitude step size as expected.  |
| Ozone input outliers check                 | Total ozone values above 600 DU or below 40 DU are not included. If the number of grid points with out of limit or NaN values exceeds 1% of the total number the input file is skipped.  |
| Error estimates                            | The $\sigma(UV_{forecast})$ is calculated for each grid point by propagation of assumed input errors as described in (REF)   |
| <b>Model/algorithms</b>                    |  |
| Calculation of clear sky UV Index          | Total ozone is the only dynamical input parameter. Solar zenith angle and sun-earth distance are calculated. Radiative transfer calculations in look-up tables. Surface albedo and aerosol optical depths found from climatologies. Algorithm described in (REF) |
| Cloudy sky UV Index correction             | As for clear sky UV index with cloud cover forecast input. The procedure to be developed and implemented during 2008.  |
| <b>Consistency</b>                         |  |
| N/A  |  |

**Table -3 Data quality and validation of individual components**

|   |  |  |
|---|--|--|
|  | <b>GSE - PROMOTE 2</b><br><b>C6 Validation Report</b><br><b>UV Index for Greenland</b> | REF: PROMOTE-2 C6<br>ISSUE: 1.0<br>DATE: 09/07/2008<br>PAGE: 6 of 16 |
|---|--|--|

## 1.5 Validation against specifications and against user requirements

### 1.5.1 Clear Sky UV Index Forecast

\*Requirements in *Italics* are recommended but not compulsory for Phase 2

| The service start planned for March 1 <sup>st</sup> 2008 was delayed 7 days |   |  |  |
|---|---|--|--|
| <b>VALIDATION AGAINST USER REQUIREMENTS</b>                                 |   |  |  |
| <b>SPECIFICATION</b>  | <b>S5</b>   | <b>REQUIRED*</b>                         | <b>ACTUAL</b>  |
| Product   | Near real time UV Index (erythema) forecast for clear sky on a 5 day span |  |  |
| Accuracy  | 0.5 dex   | +  | 0.4 dex  |
| Accuracy minimum  | n.s.  | +  |  |
| Accuracy target   | n.s.  | +  | 0.5 dex  |
| Spatial coverage  | 58-86 N , 10-75 W   | +  | +  |
| Geometric resolution  | 0.25 x 0.25 degrees   | <i>Highest available</i>                 | 0.25 x 0.25 degrees  |
| Grid/Projection   | Grid  | <i>Maximum and optimal resolution</i>    | +  |
| Temporal coverage   | NRT+5 days  | n.s.                                     | NRT+5days  |
| Temporal resolution   | 24 h  | <i>Daily, weekly, monthly (averages)</i> | 24h  |
| <b>User Interfaces</b>  |   |  |  |
| PROMOTE Web   | n.s.  | Complete, operational and up to date     | Operational and up to date. Some documents missing. Translation to Greenlandic undergoing. |
| Other Webs  | Yes   | n.s.                                     | DMI  |
| On demand   | n.s.  | n.s.                                     | n.s.   |
| <b>Data formats and data delivery</b>                                       |   |  |  |

|   |  |  |
|---|--|--|
|  | <p align="center"><b>GSE - PROMOTE 2</b><br/> <b>C6 Validation Report</b><br/> <b>UV Index for Greenland</b></p> | REF: PROMOTE-2 C6<br>ISSUE: 1.0<br>DATE: 09/07/2008<br>PAGE: 7 of 16 |
|---|--|--|

|                    |  |   |                  |
|--------------------|--|---|------------------|
| Data availability  | Operational implementation based on SCIAMACHY assimilated ozone since March 2008 | +   | +                |
| Data access        | Online   | Online                                    | +                |
| Delivery Mode      | NRT  | NRT                                       | +                |
| Delivery frequency | 24 h   | Always accessible                         | 24h              |
| Data Format        | PNG , ascii, html  | +   | +                |
| Historical archive | N/A  | <i>As long as possible (min 20 years)</i> | Since March 2008 |
| Visualization      | html pages   | +   | +                |
| <b>Remarks</b>     |  |   |                  |
| None               |  |   |                  |

\*Requirements in *Italics* are recommended but not compulsory for Phase 2

**Table -4 Validation against specifications and against user requirements for UV Clear Sky Index Forecast**

### 1.5.2 Cloud Cover Corrected UV Index Forecast

\*Requirements in *Italics* are recommended but not compulsory for Phase 2

|   |  |                          |               |
|---|--|--------------------------|---------------|
| This service will be implemented during 2008. |  |                          |               |
| <b>VALIDATION AGAINST USER REQUIREMENTS</b>   |  |                          |               |
| <b>SPECIFICATION</b>                          | <b>S5</b>  | <b>REQUIRED*</b>         | <b>ACTUAL</b> |
| Product                                       | Cloud cover corrected NRT UV Index (erythema) forecast on a 5 day span |                          |               |
| Accuracy                                      | 0.5 dex  | N/A                      | N/A           |
| Accuracy minimum                              | n.s.   | N/A                      | N/A           |
| Accuracy target                               | n.s.   | N/A                      | N/A           |
| Spatial coverage                              | 58-86 N , 10-75 W  | N/A                      | N/A           |
| Geometric resolution                          | 0.25 x 0.25 degrees  | <i>Highest available</i> | N/A           |

|   |  |  |
|---|--|--|
|  | <p align="center"><b>GSE - PROMOTE 2</b><br/> <b>C6 Validation Report</b><br/> <b>UV Index for Greenland</b></p> | REF: PROMOTE-2 C6<br>ISSUE: 1.0<br>DATE: 09/07/2008<br>PAGE: 8 of 16 |
|---|--|--|

|                                       |  |   |      |
|---------------------------------------|--|---|------|
| Grid/Projection                       | Grid   | <i>Maximum and optimal resolution</i>     | N/A  |
| Temporal coverage                     | NRT+5 days   | n.s.                                      | N/A  |
| Temporal resolution                   | 24 h   | <i>Daily, weekly, monthly (averages)</i>  | N/A  |
| <b>User Interfaces</b>                |  |   |      |
| PROMOTE Web                           | n.s.   | Complete, operational and up to date      | N/A  |
| Other Webs                            | Yes  | n.s.                                      | DMI  |
| On demand                             | n.s.   | n.s.                                      | n.s. |
| <b>Data formats and data delivery</b> |  |   |      |
| Data availability                     | Operational implementation based on SCIAMACHY assimilated ozone since March 2008 | N/A                                       | N/A  |
| Data access                           | Online   | Online                                    | N/A  |
| Delivery Mode                         | NRT  | NRT                                       | N/A  |
| Delivery frequency                    | 24 h   | Always accessible                         | N/A  |
| Data Format                           | PNG , ascii, html  | +   | N/A  |
| Historical archive                    | N/A  | <i>As long as possible (min 20 years)</i> | N/A  |
| Visualization                         | html pages   | +   | N/A  |
| <b>Remarks</b>                        |  |   |      |
| None                                  |  |   |      |

\*Requirements in *Italics* are recommended but not compulsory for Phase 2

**Table -5 Validation against specifications and against user requirements for Cloud Cover Corrected UV Index Forecast**

|   |  |  |
|---|--|--|
|  | <b>GSE - PROMOTE 2</b><br><b>C6 Validation Report</b><br><b>UV Index for Greenland</b> | REF: PROMOTE-2 C6<br>ISSUE: 1.0<br>DATE: 09/07/2008<br>PAGE: 9 of 16 |
|---|--|--|

### 1.5.3 Time Series of UV Index and Ozone

\*Requirements in *Italics* are recommended but not compulsory for Phase 2

Service started April 2008 when the first month of data was received.

Technical problems with the UV instrument in Qeqertarsuaq. Timeseries for this station will not be continued until problems have been identified and solved.

#### VALIDATION AGAINST USER REQUIREMENTS

| SPECIFICATION                         | S5   | REQUIRED*                                | ACTUAL                               |
|---------------------------------------|--|--|--------------------------------------|
| Product                               | Time series of UV index and total ozone  |  |                                      |
| Accuracy                              | N/A  | N/A                                      | N/A                                  |
| Accuracy minimum                      | N/A  | N/A                                      | N/A                                  |
| Accuracy target                       | N/A  | N/A                                      | N/A                                  |
| Spatial coverage                      | Six locations in Greenland   | N/A                                      | Six/five locations                   |
| Geometric resolution                  | 0.25 x 0.25 degrees  | <i>Highest available</i>                 | Six/five locations                   |
| Grid/Projection                       | Grid   | <i>Maximum and optimal resolution</i>    | Grid                                 |
| Temporal coverage                     | n.s.   | N/A                                      | March-October                        |
| Temporal resolution                   | Monthly  | <i>Daily, weekly, monthly (averages)</i> | Monthly                              |
| <b>User Interfaces</b>                |  |  |                                      |
| PROMOTE Web                           | n.s.   | Complete, operational and up to date     | Complete, operational and up to date |
| Other Webs                            | n.s.   | n.s.                                     | DMI                                  |
| On demand                             | n.s.   | n.s.                                     | n.s.                                 |
| <b>Data formats and data delivery</b> |  |  |                                      |
| Data availability                     | Operational implementation based on SCIAMACHY assimilated ozone since March 2008 | N/A                                      | N/A                                  |

|   |  |   |
|---|--|---|
|  | <p align="center"><b>GSE - PROMOTE 2</b><br/> <b>C6 Validation Report</b><br/> <b>UV Index for Greenland</b></p> | REF: PROMOTE-2 C6<br>ISSUE: 1.0<br>DATE: 09/07/2008<br>PAGE: 10 of 16 |
|---|--|---|

|                    |                   |   |                 |
|--------------------|-------------------|---|-----------------|
| Data access        | Offline           | N/A   | N/A             |
| Delivery Mode      | n.s.              | NRT   |                 |
| Delivery frequency | n.s.              | N/A   | Monthly         |
| Data Format        | PNG , ascii, html | N/A   | N/A             |
| Historical archive | N/A               | <i>As long as possible<br/>(min 20 years)</i> | From March 2008 |
| Visualization      | n.s.              | N/A   | html pages      |
| <b>Remarks</b>     |                   |   |                 |
| None               |                   |   |                 |

\*Requirements in *Italics* are recommended but not compulsory for Phase 2

**Table -6 Validation against specifications and against user requirements for Time series of UV index and total ozone**

|   |  |   |
|---|--|---|
|  | <b>GSE - PROMOTE 2</b><br><b>C6 Validation Report</b><br><b>UV Index for Greenland</b> | REF: PROMOTE-2 C6<br>ISSUE: 1.0<br>DATE: 09/07/2008<br>PAGE: 11 of 16 |
|---|--|---|

### 1.5.4 Spring time UV warning

\*Requirements in *Italics* are recommended but not compulsory for Phase 2

| VALIDATION AGAINST SERVICE SPECIFICATIONS  |  |  |                                      |
|--|--|--|--------------------------------------|
| This service has been in operation since April 2008. However no cases of severe ozone depletion occurred during the season, thus no warnings have been issued. |  |  |                                      |
| VALIDATION AGAINST USER REQUIREMENTS   |  |  |                                      |
| SPECIFICATION  | S5   | REQUIRED*                                | ACTUAL                               |
| Product  | Warning in case of high UV radiation level based on UV-index (erythemal) |  |                                      |
| Accuracy   | 10%  | +  | 10%                                  |
| Accuracy minimum   | N/A  | +  | N/A                                  |
| Accuracy target  | N/A  | +  | N/A                                  |
| Spatial coverage   | 58-86 N , 10-75 W  | +  | 58-86 N , 10-75 W                    |
| Geometric resolution   | 0.25 x 0.25 degrees  | <i>Highest available</i>                 | 0.25 x 0.25 degrees                  |
| Grid/Projection  | Grid   | <i>Maximum and optimal resolution</i>    | Grid                                 |
| Temporal coverage  | March-June   | +  | March-October                        |
| Temporal resolution  | 24h  | <i>Daily, weekly, monthly (averages)</i> | 24h                                  |
| User Interfaces  |  |  |                                      |
| PROMOTE Web  | n.s.   | Complete, operational and up to date     | Complete, operational and up to date |
| Other Webs   | n.s.   | n.s.                                     | DMI.DK                               |
| On demand  | n.s.   | n.s.                                     | N/A                                  |
| Data formats and data delivery   |  |  |                                      |

|   |  |   |
|---|--|---|
|  | <p align="center"><b>GSE - PROMOTE 2</b><br/> <b>C6 Validation Report</b><br/> <b>UV Index for Greenland</b></p> | REF: PROMOTE-2 C6<br>ISSUE: 1.0<br>DATE: 09/07/2008<br>PAGE: 12 of 16 |
|---|--|---|

|                    |  |   |   |
|--------------------|--|---|---|
| Data availability  | Operational implementation based on SCIAMACHY assimilated ozone since March 2008 | +   | [indicate actual]Operational implementation based on SCIAMACHY assimilated ozone since March 2008 |
| Data access        | Online   | +   | Online  |
| Delivery Mode      | NRT  | NRT   | NRT   |
| Delivery frequency | 24h  | +   | 24h   |
| Data Format        | PNG , ascii, html  | +   | PNG , ascii, html   |
| Historical archive | N/A  | <i>As long as possible</i> Issued warnings will be archived |   |
| Visualization      | html pages   | +   | html pages  |
| <b>Remarks</b>     |  |   |   |
| None               |  |   |   |

\*Requirements in *Italics* are recommended but not compulsory for Phase 2

**Table -7 Validation against specifications and against user requirements for Spring time warning**

|   |  |   |
|---|--|---|
|  | <b>GSE - PROMOTE 2</b><br><b>C6 Validation Report</b><br><b>UV Index for Greenland</b> | REF: PROMOTE-2 C6<br>ISSUE: 1.0<br>DATE: 09/07/2008<br>PAGE: 13 of 16 |
|---|--|---|

## 1.6 Quality assessment and control procedures: Service quality

### 1.6.1 Clear and cloud corrected Sky UV Index Forecast and Spring time UV Warning

| Service Quality                         |   |  |  |   |
|---|---|--|--|---|
| Service delivery start date: N/A        |   |  |  |   |
| SPECIFICATION                           | S5  | REQUIRED*  | ACTUAL   | N checks/Delivery period °                              |
| Quality checks                          | Internal control of ozone input outliers.<br>Deviations are flagged.<br><br>Two validations per season. | <i>Required</i>  | Total ozone values outside the interval [50:600] are not used. Number and location of those grid points are printed to log-file.<br><br>Validation against ground based data will be performed for the periods March-July and August-October | daily<br><br><br><br><br><br><br><br><br><br>2 per year |
| Product confidence interval             | n.s.  | n.s.   | N/A  | N/A   |
| Error bar definition and representation | 1 $\sigma$  | <i>Estimation of error limits: min-max range of expected true value in the ground for each individual day/month/year</i> | N/A  | N/A   |



## GSE - PROMOTE 2

### C6 Validation Report UV Index for Greenland

REF: PROMOTE-2 C6  
ISSUE: 1.0  
DATE: 09/07/2008  
PAGE: 14 of 16

|   |   |                           |  |                |
|---|---|---------------------------|--|----------------|
| Representation of missing data                | In case of missing input ( assimilated total ozone) the processing is performed using ozone climatology stored locally. Reporter to operator. | <i>Clearly indicated</i>  | If the correct input file is not received at the time of processing (04 UT) the processor use the ozone climatology.<br><br>Tested and occurred once during delivery period, | Daily          |
| Documentation of process failure              | e-mail to operator  | <i>Clear and complete</i> | Status of process (success/failure) logged and mailed to operator.   | Daily          |
| Version control mechanisms and representation | Old versions are still available. Modifications will be shortly documented and introduced to the user   | <i>n.s.</i>               | Old versions will be available. Modifications will be shortly documented and introduced to the user  | No changes yet |

\*Requirements written in *Italics* are not compulsory for Phase 2

°Between 1<sup>st</sup> March and 30<sup>th</sup> of Mayor delivery date (you can send this information separately if this document is delivered at an earlier date.

Table -8 Validation of quality assessment and control procedures for Clear and cloud corrected Sky UV Index Forecast and Spring time UV Warning

|   |  |   |
|---|--|---|
|  | <b>GSE - PROMOTE 2</b><br><b>C6 Validation Report</b><br><b>UV Index for Greenland</b> | REF: PROMOTE-2 C6<br>ISSUE: 1.0<br>DATE: 09/07/2008<br>PAGE: 15 of 16 |
|---|--|---|

## 1.6.2 Time series of UV index and ozone

| Service Quality                         |  |  |  |                            |
|---|--|--|--|----------------------------|
| Service delivery start date:            |  |  |  |                            |
| SPECIFICATION                           | S5   | REQUIRED*  | ACTUAL   | N checks/Delivery period ° |
| Quality checks                          | Internal control of ozone input outliers. Deviations are flagged. Two validation per season. | <i>Required</i>  | Total ozone values outside the interval [50:600] are not used. Number and location of those grid points are printed to log-file.<br><br>Validation against ground based data will be performed for the periods March-July and August-October | Daily                      |
| Product confidence interval             | n.s.   | n.s.   | N/A  | N/A                        |
| Error bar definition and representation | n.s.   | <i>Estimation of error limits: min-max range of expected true value in the ground for each individual day/month/year</i> | N/A  | N/A                        |
| Representation of missing data          | Not enabled/monthly manual   | <i>Clearly indicated</i>   | Missing data points are not represented in the time series plot.   | Monthly                    |
| Documentation of process failure        | Not enabled/monthly manual   | <i>Clear and complete</i>  | If no data available for time series, an explanatory text will be placed instead.  | Monthly                    |

|   |  |   |
|---|--|---|
|  | <b>GSE - PROMOTE 2</b><br><b>C6 Validation Report</b><br><b>UV Index for Greenland</b> | REF: PROMOTE-2 C6<br>ISSUE: 1.0<br>DATE: 09/07/2008<br>PAGE: 16 of 16 |
|---|--|---|

|   |      |             |     |     |
|---|------|-------------|-----|-----|
| Version control mechanisms and representation | n.s. | <i>n.s.</i> | N/A | N/A |
|---|------|-------------|-----|-----|

\*Requirements written in *Italics* are not compulsory for Phase 2

°Between 1<sup>st</sup> March and 30<sup>th</sup> of Mayor delivery date (you can send this information separately if this document is delivered at an earlier date.

Table -9 Validation of quality assessment and control procedures for time series of UV index and Ozone

## 1.7 References

### 1.7.1 Electronic references and online data access paths

UV Record archive

[http://promote.fmi.fi/promote\\_fmi.html](http://promote.fmi.fi/promote_fmi.html)

<http://promote.dmi.dk/>

<http://ozone2.fmi.fi/uvdb/index.html>

<http://www.woudc.org/>

<http://www.biospherical.com/NSF/default.asp>

<http://nadir.nilu.no/~olaeng/fastrt/README.html>

<http://www.libradtran.org/>

### 1.7.2 Bibliographic references