Release notes for SAFNWC/PPS version 2012
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07 May 2012   .

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0) About this release
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This is release 2012 of the SAFNWC/PPS software package. It
contains five sub-packages, packed in totally seven
tar-balls (versioning of the individual packages are
git-release tags):

      - AHAMAP-r1_66
      - ACPG-r2_49
      - CPP-v4.2
      - PPS_TaskManager-r1_23
        - py_packages-v0.5.4 (or alternatively pps_nwp-v0.4.8
                      + separately downloaded python
                      packages)

   packages containing data:
      - ACPG-r2_49 testdata (example data)
      - CPP-v4.2 ancillary data (necessary for
                        CPP-processing)

In addition the PPS-2012 release contains a "reference
dataset".

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1) Why you should care!
=======================

The two main reasons to upgrade to version 2012 are if you
wish to process on VIIRS data and if you are interested in
having access to the new PPS product with information on
cloud microphysical parameters, the PGE05 Cloud Physical
Properties (CPP).

Other reasons could be:
* v2012 has been improved concerning GRIB-2 processing
  compared to v2010 and previous versions does not process
  GRIB-2 at all.
* There are updates in the usage of third party software.
* There are some corrections in data use affecting the use
  of sea ice information and tropopause temperature.

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2) Summary of main changes since version 2010
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The main changes since version 2010-patch3:

* Added the new PGE: Cloud Physical Properties
  The main products are: Liquid Water Path and Cloud Phase.
  Please note that Cloud Phase is fully validated, while the
  Liquid Water Path is only properly validated over sea.

  The additional products are: Ice Water Path, Effective
  Radius and Cloud Optical Thickness. The additional products
  are not validated.

  The CPP algorithm is developed at KNMI in the framework of
  the Climate Monitoring SAF but has been adapted technically
  by SMHI and KNMI to run seamlessly as the other PPS Product
  Generation Elements.

* Processing of VIIRS data from Suomi NPP (and later the JPSS
  series) has been enabled for all PGEs. However, PGE04 on
  NPP/JPSS is not adapted to use ATMS and with only VIS/IR
  information this PGE is not recommended for operational
  use on NPP, but only on NOAA/Metop with a functioning MHS
  instrument.

* Processing is now only done in satellite projection. But
  afterward the products can be remapped to any user defined
  region (in a user defined cartographic map projection) as
  desired.
  NB! This means that the old region-scripts and programs can
  not be used, so any processing scripts has to be adjusted
  for swath processing. See the SUM for further details.

* New NWP reading. The PPS nwp reading has now been placed

in a separate package: PPS_NWP, which is delivered both
separetely and in the py-packages collection. PPS_NWP in
turn, uses GRIB-API for NWP reading, post-processing and
remapping. PPS_NWP can also be used outside PPS for
NWP-reading, if wanted.

* Somewhat easier installation of PPS itself.

* The processing of the Cloud Top phase flag (part of the
  Cloud Type product) is now as default turned off. Which is
  according to our new recommendations. Please use the CPP
  Cloud Phase instead.

* Major bug corrections:

  A bug in the tropopause calculations, sometimes causing
  very large errors, has been corrected. This affects the
  discrimination of very high and high opaque clouds in the
  PGE02.

  A bug in the cloudmask coast scheme, affecting small lakes
  inland and small islands at sea, was partly corrected
  before, but has now been corrected in all situations.

  Corrected application of pole mask for osisaf ice maps.

Some changes implemented in version 2012 were already
available in the v2010 patches:

* Fully GRIB-2 ready.
* Correcting an error in reprojection; causing half a pixel
  deviation in the remapping.

For more details se: Bug corrections and improvements,
section 6)-8).

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3) Installation
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The installation of PPS v2012 is described in the
installation note. See installation_note_2012.txt

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4) Configuration of the PPS-system
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Environment:
===========

Make sure that your PYTHONPATH point at where the needed
python packages (numpy, scipy, h5py, etc) are found!

ACPG:

```
====
pps_basic_configure.py
      * Perhaps you need to adjust the parameter
      NWP_TIME_RESOLUTION?
      * Be sure to have the right prefix NWP_FILE_PREFIX
      matching your NWP model!

      * Adjust the switch for 'moving window' option for
      CTTH semi-transparent correction algorithm:
        # Example:
        for pltfrm in NOAA_METOP_LIST:
            CTTH_WITH_SHIFT_PLATFORM[pltfrm]=1
        (when set to "1" the moving window option is ON and
        the result is more valid data on the cost of a
        longer processing time.)

      * Perhaps you want to adjust the python dictionary
      IMAGES, controlling which satellites and products
      that will have images generated, and in which format.
      CPP_PRODUCTS sets which of the CPP products that
      will have images, and also which will be remapped.

      * Perhaps you want to adjust the parameter
      THUMBNAIL_IMG_SIZE to control the size of the
      thumbnail images. It is currently set to xsize/3
      times ysize/3 (where xsize,ysize are the dimensions
      of the original product images).

  region_config.cfg:
      In case you plan to do remapping with PPS: Do you
      have all the region definitions needed available in
      here?

  pps_config_common.cfg:
      We recommend you to process all PGE products,
      accordning to default
      settings. Eg. you should normally generate all three
      CTTH products (i.e. parameters
      GENERATE_TEMPERATURE:yes;GENERATE_PRESSURE:yes;
      GENERATE_HEIGHT:yes)

      We recommend not to use the cloud type phase flag
      (GENERATE_PHASE_FLAG:no). The quality is not properly
      validated and the cloud phase provided by the new
      PGE05 which is also better validated is
      anyhow superior in quality. So, if you are
      interrested in cloud phase we recommend the CPP
      (PGE05) cloud phase product instead.

      You would need to adapt the parameter
      LOG_COMMUNICATION:
      LOG_COMMUNICATION: ax015 {
            WITH_TASK_MANAGER:    no
            LOG_DAEMON_PORT_NUM:  2961
            LOG_DAEMON_SERVER:    ax015.smhi.se
      };
      Be sure to enter a "yes" above if you wish to run the
```

ACPG through the task manager and its log-daemon.
And, specify the port number and server adress
corresponding to where the log-daemon is running (the
task manager default port number is 2961 as above).

It could also be that you do not want to use OSISAF
ice maps, then you set WITHOUT_SEAICE to yes. You
find this parameter under PGE01 in the same config-
file. This is for instance if you do not have access
to OSISAF Ice products in real time or if you are
anyhow processing over a region far from the Arctic
or Antarctic Oceans where Sea Ice is present.

.profile_pps: (or source_me)
        (Both these files are generated automagically from
    the source_me.in and the profile_pps.in upon running
    the autoconf configure script. So changes to these
    files will be overwritten next time you run
        "./configure", "make", "make install".)

    SM_OVERWRITE=0
    SM_LOGGING=0

    Make sure DIR_NAVIGATION points to the directory
    where you have the sub-directories with AAPP satpos
    files, ephemeris files and orbit parameters. E.g.:
            ana
            ephe
            orb_elem
            satpos
            tle_db
            tmp
            tracking

PPS-TM:
======
The PPS-Task Manager is being configured, at least partly,
during the interactive installation process (when invoking
the script install.ksh). During the interactive installation
you have to anwser some questions and the parameters you
define are being entered into the installed python files. It
makes use of template files (<python-filename>.tpl) which are
being converted to .py files upon installation.

After installation you can change the configuration settings
(including the parameters you just specified) in a number of
configuration files. The most frequently visited files and
parameters are given here below:

module_config.py:
    You should check and modify (according to your local
    environment and requirements) most of the parameters
    available.

    Parameters which should (normally) not be changed:
    * NOT_ALLOWED_USER_REQUESTS
    * EXCLUSIVE_MODULES

```
        * TIME_ONLINE_PRODUCTS_FINISHED

        We run currently with these settings:
        PRODUCTION_PRIORITY = 1
        NUMBER_OF_SIMULTANEOUS_ORDERS=1

comm_config.py
        It contains only three parameters, and these have
        been set (hopefully correctly) during your
        installation! However, it is crucial for the TM
        communication with ACPG that you use correct
        server-names and ports, of course! Check
        pps_comm_config.cfg from the ACPG installation, see
        below

schedule_config.py
        You might want to change:
        SATELLITE_PRIORITIES    (content has to match
        SUPPORTED_SATELLITES)

tm_config.py
        You might want to change:
        SUPPORTED_SATELLITES    (content has to match
        SATELLITE_PRIORITIES)

Areas:
======
Areas are only needed if you intend to remap the satellite
projection products to region projection.

The area/region definitions shall be available only at one
place, namely in the region_config.cfg file. Please avoid
having permanent definitions in the pcs/area plugin files!

If a new area/region is created, remapped physiography data
needs to be generated first and the file should be put in the
directory holding the remapped physiography files, which is
normally <pps-data-root>/import/AUX_data/remapped.



==================================================
5) Configuration changes since PPS version 2010
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The changes in configuration files from PPS v2010 to PPS
v2012 are quite large, for a number of different reasons
(adding CPP, adding NPP, new NWP reading, removed region
processing etc.)
So do not try to re-use any configuration file from earlier
PPS installations, neither for ACPG environment settings or
configuration files, nor for the Task Mangager configuration
files.

Some changes, anyhow, worth to specially notice are:

PYTHONPATH has to be set to a place where you have numpy etc
```

installed. (This has to be set outside .profile_pps / before
running source.)

ACPG/AHAMAP configuration changes
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Changes in calling configure
Removed:
    --with-numpy (numpy now found through PYTHONPATH) (both
    ACPG and AHAMAP)
    --with-grib_api (GRIB-API only indirectly used by ACPG
    now, via pps_nwp)
    --with-emos (EMOS is not used any more)
Added:
    --with-gac (to be set to no, unless you mainly process
    GAC-data)

Changes in pps_config_common.cfg
-GENERATE_PHASE_FLAG (for PGE02) changed default value to
 "no".
-Added a recommendation NOT to change CTTH settings.

There are several changes -both added, removed and changed
parameters- in:
    .profile_pps/source_me
    pps_basic_configure.py

The following configuration files are removed:
  /cfg/hirlamx_translation_table.cfg
        grib_type_of_level.cfg
        grib_config.cfg
        ecmwf_translation_table.cfg
        emos2gribapi_translation_table.cfg

Task Manager configuration changes
==================================

The set-up configuration of the Task Manager works as before,
with an interactive installation.
For the files, saving the configuration,
PPS_TaskManager/python/*config.py (generated from
PPS_TaskManager/python/*config.py.tpl), there are changes
in more or less all files.

Some changes wort to notice are:

changes in tm_config.py.tpl and schedule_config.py.tpl
-Changed satellites supported in SUPPORTED_SATELLITED and
SATELLITE_PRIORITIES.
-Changed a number of timing parameters.

changes in module_config.py.tpl
-SUPPORTED_MODULES is changed due to doing only swath
processing; there has been changed which modules that exists.
-Those changed modules also affect to following parameters:

NOT_ALLOWED_USER_REQUESTS, ORDER,DEPENDENCY,
PROCESSING_STEPS, MODULE_PRODUCT_AREAS,
TIME_ONLINE_PRODUCTS_FINISHED
-The only allowed region in AREA_PRIORITIES and
MODULE_PRODUCT_AREAS is 'satproj'

===
6) Bug corrections and improvements to ACPG since PPS
   version 2010
===

For more details consult the list of SPRs/SMRs at the NWCSAF
Help Desk.

The main changes since version 2010-patch3:

* Added the new PGE: Cloud Physical Properties

  The main products are: Liquid Water Path and Cloud Phase.
  Please note that Cloud Phase is fully validated, while the
  Liquid Water Path is only properly validated over sea.

  The additional/optional products are: Ice Water Path,
  Effective Radius and Cloud Optical Thickness. The optional
  products are not validated.

* Now the products can be processed on VIIRS data (i.e. from
  the satellite Suomi-NPP). It works well for PGEs 01, 02, 03
  and 05, while the PGE04 will get reduced quality as there
  is no replacement for the AMSU-data used when processing on
  NOAA/Metop data.

* Processing is now only done in satellite projection. But
  afterward the products can be remapped to regions, if
  wanted.
  NB! This means that the old region-scripts and programs
  can not be used, so any processing scripts has to be
  adjusted for swath processing. See the SUM for further
  details.

* New NWP handling.

  The PPS nwp reading, post-processing and remapping has now
  been placed in a separate package: PPS_NWP, which is
  delivered in py-packages (and separately). PPS_NWP in turn,
  uses GRIB-API for NWP reading. EMOS is not used any more
  in PPS. The advantage for the user is that the application
  can deduce more information from the Grib field by it self,
  and thus the following configuration files are not needed
  any more:

    grib_config.cfg
    ecmwf_translation_table.cfg
    hirlamx_translation_table.cfg
    emos2gribapi_translation_table.cfg

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* PPS_NWP can also be used outside PPS, if desired.

* Another use of the new NWP handling is: There has been added a script in ACPG (ppsCheckNwp.py) for checking NWP-files. It can be used before giving a certain NWP-file as input to PPS, in case you are not sure whether it contains the necessary fields.

* Somewhat easier installation of PPS:
The py_packages collects several packages, making the installation of all these packages easier in cases where they are not already found in your system Also, there is a better checking and control that the correct s.w. versions are used. etc. So you should be alerted earlier if something is not right in your environment.

* The Cloud Top phase flag is now as default set to not be generated. Which is according to our new recommendations. Please use the CPP Cloud Phase instead.

* In the PGE04 product: The AMSU data interpolation is made smoother, instead of having the AMSU data as ellipses on top of the AVHRR data.

Major bug corrections:

* A bug in the tropopause calculations, sometimes causing very large errors, has been corrected. This affects the discrimination of very high and high opaque clouds in the PGE02.

* A bug in the cloud mask coast scheme, affecting small lakes inland and small islands at sea, was only partly corrected before, but has now been corrected in all situations.

* Corrected application of pole mask for osisaf ice maps.

* Removed a few bugs that caused to processing to go down in certain situations

Minor bug corrections:

* Adapted for a more careful filter engine. I.e. being careful with nodata handling when calculating textures.

* Made it possible to remap physigraphy data, also for areas containing Antarctica.

Other minor improvements:

* Prepare the PPS s.w. for EARS-distribution, i.e. writing AVHRR geolocation data.

* Changes to save a little processing time, only marginal so

far.

* PGE01 test flag expanded to also contain two flags for
  channel 8.5 micron (a spectral band in MODIS and VIIRS).
  Though no new threshold tests added.

* Improved regression testing: added CPP, GAC, GlobalMetop;
  easier to run and adapted to only-swath processing.

* Logging is improved, but that should not be visible to the
  user.

* Making the code more homogeneous

* A more consistent use of THUMBNAIL_IMG_SIZE

Some changes where already implemented in the v2012 patches,
but are included also in v2012:

* Better adaptation for GAC-processing and other CMSAF needs.
(Details in the release notes of the patches.)

* Better prepared for GRIB-2. A few bugs were detected and
  fixed. It is now also possible to read files with both
  GRIB edition 1 and GRIB edition 2 fields in the same file.

* Replaced the threshold tables for eos1 and eos2. The old
  ones were incorrect.

* Correcting an error in reprojection; causing half a pixel
  deviation in the remapping.

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7) Bug corrections and improvements to AHAMAP since PPS
   version 2010
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For more details consult the list of SPRs/SMRs at the NWCSAF
Help Desk.

One major bug has been corrected in AHAMAP version 2012:
* Bug correction affecting very long swaths over the pole
  regions. Before AHAMAP did not handle correctly the cases
  when the swath goes over the pole and is both covering the
  0 degree meridian and the 180 degree meridian outside the
  pole region (south of 70 deg N or north of 70 degree S).
  NB! Not affecting local reception (only affecting EARS
  processing concatenating 1-minute granules into long
  swaths).

Otherwise, for v2012 there are only small changes in AHAMAP,
and they are all related to the changes already described for
ACPG.

Some major changes in AHAMAP were also implemented in the
v2010-patches:
* Corrected an error in reprojection; which was causing half
a pixel deviation
* Adaptations for CMSAF-needs; mainly a better GAC-processing

===
8) Bug corrections and improvements to PPS Task Manager
   since PPS version 2010
===
For more details consult the list of SPRs/SMRs at the NWCSAF
Help Desk.

The main changes in the PPS Task Manger are:

* Processing on swath instead of in regions.

  As for ACPG, all processing is now done on satellite
  projection. In ACPG there is functionality available for
  remapping products on satellite swath to a map projection.
  Using this functionality (e.g. ppsRemapProduct.py) it is
  easy to add a remapping module to the Task manager that
  remaps all products to the areas/regions desired. See the
  SUM

* Handling VIIRS (NPP) data.

* Processing the new PGE: PGE05, Cloud Physical Properties.

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9) New code packages since PPS version 2010
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CPP
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The new PGE, PGE05, Cloud Physical Properties is delivered
in a separate package. The software for CPP is developed by
KNMI, under CM-SAF. But it is now distributed through NWCSAF.

Anyhow, there are scripts in ACPG serving the CPP-package.
Eg. scripts used for starting the processing, and for adding
additional information in the output file. Once installed,
the CPP will run in a seamless way compared to the other
PGE:s.

PPS_NWP
=======

PPS_NWP is a new python package for handling NWP Grib (ed 1
or 2) data. In replaces code in the ACPG package.

PPS_NWP in turn calls GRIB-API. Thus GRIB-API is compulsary
to have installed.
PPS_NWP is delivered on NWCSAF helpdesk within in the

package py_packages.(and separately)

PPS_NWP can also be used outside SAFNWC/PPS, as a convenient
NWP-reader.

py_packages
===========

py_packages is a collection of python packages, packed
together. PPS_NWP is one of them, but is also available
seperetely. The other python packages are commonly available
from other sources. For running PPS you might as well use
those packages from their original source, they are just
packed together for the sake of the user's convenience.

The packages contained are:

 configobj
 h5py
 mock
 multiprocessing
 nose
 numpy
 pps_nwp
 pygrib
 pyproj
 pyresample
 scipy
 setuptools

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10) Third Party Software
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Installation of course provides you have the necessary
3rd-party software
installed. See the software users manual!

For recommended versions of third party software, see also the
Software Version
Document (SVD), the the help desk, or the installation notes
(installation_note_2012.txt).

Some notes on needed versions:

* You need hdf5 version 1.8.1, or later.

* You need hl-hdf version 0.8.0, or later

* It is recommended that you use AAPP of version 6.6 or
  later. Earlier it has been recommended to configure without
  AAPP, but now it is recommended to use AAPP. It is a
  necessity if you want PPS to run on global Metop!

* When GRIB API is built with JasPer support, the JasPer
  library must be available as a shared library. If you

build JasPer from source, add --enable-shared to the
JasPer configure command.

* RTTOV-9 requires the NPP-patch, if you are going to
  process NPP data.

* For Grib-API version 1.9.5 should not be used.

Changes in third party software needs since v2010:

* New dependencies are:
  SciPy
  h5py
  pygrib
  pyproj
  pyresample

  All those are delivered in the supplied py_packages
  package.

* EMOS-library is not used any more. (for v2010 it was
  optional)

* GRIB-API is now needed (for v2010 it was only optional,
  but recommended).

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11) Documentation
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There are two new scientific Validation Reports since PPS
2010. And a new ATBD for the new product Cloud Physical
Properties. For the other documents available, there are
updates to all of them. Please download the documentation
from the NWCSAF Help Desk!

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12) Known open issues
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Remaining issues:
* The Task Manager can so far only do sequential processing
of PGEs. This means that it is for instance currently not
possible to run PGE03 and PGE04 and PGE05 at the same time
(they are all not dependent on each other but only on the
cloud mask and type). This would otherwise improve timeliness
of these products. It is being investigated how to alleviate
this shortcoming in the future, and a patch to the task
manager can be expected.   (SPR: 502)

*The CPP algorithm processes the whole swath, even if it is
night everywhere and no product data can be produced (the CPP
retrieval requires daylight). It is planned for the future to
terminate processing early in such cases.

*In a few cases it could happen that the CPP product
processing takes very long time. The task manager will stop
it after a configurable time, but without task manager it
will just go on running. It is planned to investigate why
this is occuring, and how it can be avoided.

There is one open Software Problem Reports (SPRs):
502 "No parallel processing", for PPS.TM.

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13) Reference data
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One sets of reference data with final results and
intermediate (temporary) output of PPS running version 2012
on the testdata is available:

    PPS_refdata_v2012_c14475.tgz

There are four cases of hrtp data, noaa16, noaa17, noaa18 and
metop02. There are one Global Metop case and one GAC case.
The hrpt noaa18 and metop02 cases uses OSISAF ice
concentration data. The moving window option is off for all
cases.

It contains intermediate and final output of running the PPS
on the testdata included in the acpg-subpackage. This
reference dataset was generated on the development
environment at SMHI (Red Hat Enterprise Linux Server
release 6.2 (Santiago) with gcc/fortran 4.4.6).

The following local environment was used:

AHAMAP Version: 1.66
ACPG Version :   2.49
pps_nwp version: 0.4.8 (also included in the py_packages
                   package)

HL-HDF: build38 (later than 0.7.9, similary to
                   0.8.0)

AAPP: 6.12
RTTOV: 9.3 (with patch for npp)
GRIB-API: 1.9.9

HDF5 Version :   1.8.5-patch1
PROJ Version :   4.7.0
Python version: 2.6.6
PIL: 1.1.6
ZLIB Version :   1.2.3
jpeg: 6b

```
py_packages version: 0.5.4  - Contains pps_nwp above and
other external python packages liste below.

Python packages (also included in the py_packages package):
pygrib version:     1.9.2
   (http://code.google.com/p/pygrib/downloads/list)
h5py version:       2.0.1
   (http://code.google.com/p/h5py/downloads/list)
pyresample version: 0.7.9
   (http://code.google.com/p/pyresample)
pyproj version:     1.8.9
   (http://pypi.python.org/pypi/pyproj)
scipy version:      0.9.0
   (http://www.scipy.org/Download)
NumPy version:      1.6.1
   (http://www.scipy.org/Download)

The following settings are used:
SM_COASTALZONE_LIMIT = 64
SM_LANDSEA_FRACTION_MAX = 255

S.w. related to the task manager (does not influence the
refrence data though)
PPS-TM version:     r1_23
Tkinter version:    2.6.6
Tk/Tcl:             8.5.7
Pmw version:        1.3.2


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15) Disclaimer
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 1) The Cloud Physical Properties product Liquid Water Path
 is only properly validated over sea, but not over land.

 2) The products has been processed on NPP data, it works
 techically and the products are similar to products from
 other satellites. But there has not been made any validation
 on NPP data. The validation is planned for later this year.

 3) This version is not yet ready to process Metop-B. Metop-B
    will be launched end of July this year, and we expect to
    have a patch ready in due course so that PPS will be
    ready once Metop-B data are available.


These disclaimers below were also issued (in similar wording)
with version 2010 (and some with v2009).

 4) ifort on Intel:
    No testing of version 2012 with Intel Fortran compilers
    done. We expect that PPS-v2012 will not work as is with
    these compiler suites.
    If anyone needs ifort on linux we will try to see if it
    is feasable to accommodate the adaptations needed.
```

5) Performance over Antarctica:
   The performance of PPS over Antarctica is problematic. We
   have so far done no validation over that area, and there
   are known problem issues there:
   * The landuse (land/sea mask) is generated from the USGS
     GTOPO30 database as the USGS Global Land
     Characterization database does NOT include Antarctica!
     There are likely to be inaccuracies in the land/sea
     mask as a consequence of this.
   * We do not yet use the OSISAF Ice maps for the southern
     hemisphere.
   * The IR calibration from AAPP sometimes with the current
     AHAMAP generate nodata values due to very cold
     temperatures. This result in nodata values in the PPS
     products (black dots in images - noisy pattern).

6) GAC product quality
   The product quality for GAC is still lower than for the
   hrpt products, read more about this in section 16).

==
16) GAC product quality
==
PPS version 2012 includes an interface to process basic
images and cloud products from the NOAA AVHRR GAC data
record (Global Area Coverage data ~ i.e., global AVHRR data
reduced to 4 km resolution).

The interface applies calibration corrections for the full
series of NOAA satellites (i.e., NOAA-7 to NOAA-19 and
Metop-A) in order to produce historically consistent AVHRR
GAC radiances. Corrections were derived from Simultaneous
Nadir Observations comparing AVHRR radiances with MODIS
radiances and comparisons with various stable reference
targets on the Earth surface (Heidinger and Straka, 2010).
Since the definition of calibration corrections can only be
made based on historical data (several years of data),
the corrections for the most recent satellite (NOAA-19)
should be considered as preliminary. More accurate
corrections will be provided in the next PPS version.

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