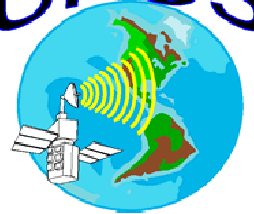




Polar Stratospheric Clouds **UPOS** Detectability Functional Requirements



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Overview

1.1 Statement of Purpose

The Polar Stratospheric Clouds Detectability model has been developed to make daily forecasts of PSCs in the lower stratosphere using AFWA MM5 weather data. The model produces color maps showing PSC probability at high latitudes, using either fixed or climatological values of HNO_3 and H_2O mixing ratios.

1.2 Summary of Architecture

The system architecture is based on software currently used for similar purposes at JHU/APL. Figure 1 shows a diagram of the architecture and data flow.

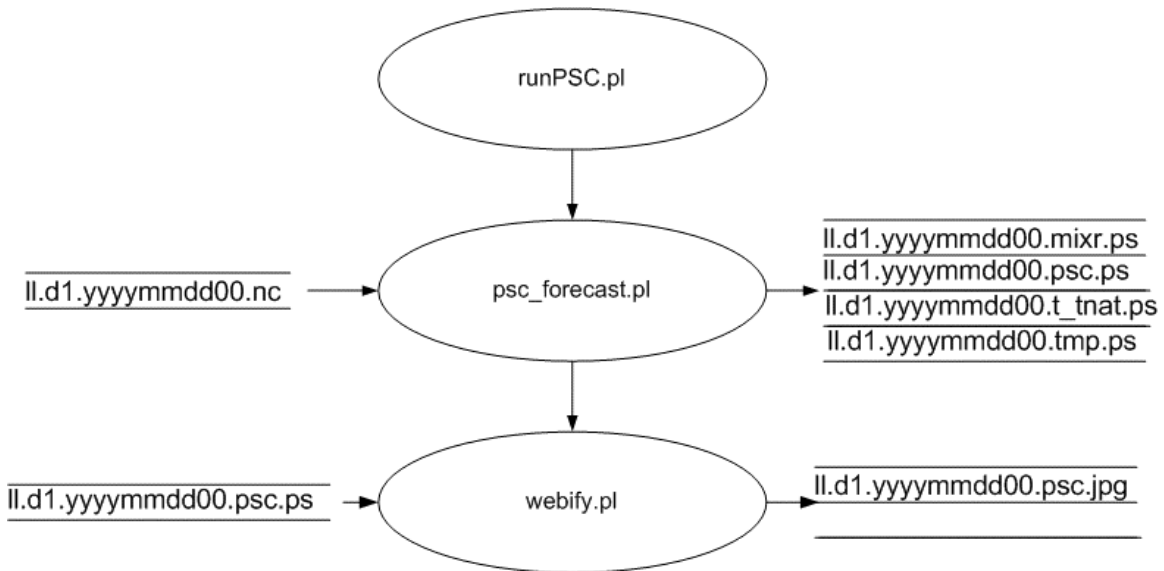


Figure 1.

An executive script coordinates the execution of the PSC Detectability process. The output images can be displayed using most image viewers such as `xv` or any web browser.

The PSC Detectability application requires AFWA MM5 gridded binary format data (grib). The MM5 weather data variables used by the PSC model are extracted and saved in a NetCDF format by an IDL subprocess. The MM5 NetCDF file is designated by a letter prefix "d" (i.e. `d02012203`, 2002-Jan-22 at 3 GMT). The PSC Detectability application reads in the appropriate NetCDF data files for each model time step and calculates PSC probability. The model outputs temperature (temperature and temperature relative to T_{NAT}), water vapor, and

PSC probability calculations on 24 pressure levels from 1001 to 10 mb (temperature relative to T_{NAT} and PSC probability only on the top 6 levels, from 150 to 10 mb). The output files are in Postscript format. The PSC Detectability output data is converted by a perl script that reads in the PSC Detectability output and produces .jpeg images showing the probabilities of PSC occurrence on each level.

2 Executive Script

2.1 Functional Requirements

- 2.1.1 The executive script shall manage the execution of the PSC Detectability software.
- 2.1.2 The executive script shall provide the location of the installation directory.

2.2 Interface Requirements

Input Interfaces

None

Output Interfaces

- 2.2.1 The executive script shall produce status and error messages.

User Interfaces

- 2.2.2 The executive script shall be editable using at least one UNIX compatible editor.

2.3 Operational Requirements

- 2.3.1 The Executive Script shall run under the Solaris operating system on a SUN computer.
- 2.3.2 The Executive Script shall begin execution upon direction.
- 2.3.3 The Executive Script shall terminate upon direction.

3 PSC Detectability Process

3.1 Functional Requirements

- 3.1.1 The PSC Predictability Model shall ingest MM5 netcdf weather data generated from the JHU/APL Arctic/Antarctic daily runs. The model translator can generate input for the PSC Predictability Model for any hour during the 24-h forecast cycle. The data are then converted to a standard latitude/longitude grid for use by the PSC model. The run script generates forecasts for the N.H. and S.H. winters, depending on settings of user flags.
- 3.1.2 The model shall produce polar stereographic maps showing PSC probability, temperature, temperature relative to T_{NAT} , and water vapor mixing ratio at the interpolated model pressure levels.
- 3.1.3 The maps shall use color overlays to show PSC probability, temperature, temperature relative to T_{NAT} , and water vapor mixing ratio.
- 3.1.4 The PSC Detectability Process shall output jpeg images of the probabilities of PSC occurrence in the stratosphere.

3.2 Interface Requirements

Input Interfaces

- 3.2.1 The PSC Detectability Process shall ingest MM5 forecast files in the netcdf format. The file contains fields, which have been interpolated from a polar stereographic grid to a uniform $1^\circ \times 1^\circ$ latitude/longitude grid. The fields and units of the file are as follows: latitude in degrees, longitude in degrees, pressure levels in pascals, temperature in Kelvin and vapor mixing ratio in kg/kg.

Output Interfaces

- 3.2.2 The PSC Detectability Process shall output a series of Postscript and JPEG files which contain temperature, water vapor, and PSC probability calculations on 24 pressure levels from 1001 to 10 mb (t_{nat} and psc only on top 6 levels, from 150 to 10 mb).

User Interfaces

None

3.3 Operational Requirement

- 3.3.1 The PSC Detectability Process shall run under the Solaris operating system.
- 3.3.2 The PSC Detectability Process shall begin execution upon direction of the user.

4 References

Hanson, D. and K. Mauersberger, Laboratory studies of the nitric acid trihydrate: Implications for the south polar stratosphere, *Geophys. Res. Lett.*, **15**, 855-858, 1988.

APPENDIX A: Acronyms and Abbreviations

AFWA	Air Force Weather Agency
APL	Applied Physics Laboratory of Johns Hopkins University
ASCII	American Standard Code for Information Interchange
CLAES	Cryogenic Limb Array Etalon Spectrometer
COE	Common Operating Environment
FTP	File Transfer Protocol
GRIB	Gridded Binary
GSFC	Goddard Space Flight Center
HALOE	Halogen Occultation Experiment
IDL	Interactive Data Language
JHU	Johns Hopkins University
LAN	Local Area Network
MLS	Microwave Limb Sounder
MM5	Fifth Generation Mesoscale Model
NAT	Nitric Acid Trihydrate
netCDF	Network Common Data Form
NWP	Numerical Weather Prediction
PNG	Portable Network Graphics
POAM	Polar Ozone and Aerosol Measurement
ppbv	Parts per billion by volume
ppmv	Parts per million by volume
PSC	Polar Stratospheric Cloud
SD	Space Department of the Applied Physics Laboratory
SDP	Software Development Plan
Tcl	Tool Command Language
Tk	Toolkit
UPOS	University Partnering for Operational Support
UTC	Coordinated Universal Time
XDR	External Data Representation