

# Processing of TOVS-data at SMHI

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## 1. BACKGROUND

The work with TOVS-data at SMHI started in 1983 with the implementation of the International TOVS Processing Package, version 2 (ITPP2). ITPP2 was used during the ONSAM Experiment, see [1], where satellite soundings were compared to radiosondes, see [5]. A new nonlinear, physical inversion method THAP was developed at SMHI and included in our version of ITPP2. Due to the cloud-clearing algorithm in ITPP2, we were only able to test THAP for clear retrievals, see [6],[7] and [8]. The cloud-clearing algorithm in ITPP3 was more suitable for us, and we incorporated THAP in our version of ITPP3, see [9] and [10]. Until now we have used climate as first guess, with the possibility to include analyzed tropopause height.

In 1985 a coordinated Nordic research project, the HIRLAM-project <sup>1</sup>, was started. An improved utilization of TOVS data was given high priority within the HIRLAM-project. A data assimilation experiment with TOVS-data, using THAP, was carried out, see [4]. This data assimilation experiment was using historical data from May, 1983. The purchase of a satellite data receiving and processing station PROSAT <sup>2</sup>, giving us TOVS-data in real-time, started some years ago. Due to problems with subcontractors, it was delayed but now it has been installed at SMHI. PROSAT is described in [2] and [3]. A description of the computer system of SMHI, including the interconnection to PROSAT, is shown in Figure 1.

<sup>1</sup>HIRLAM= High Resolution Limited Area Model

<sup>2</sup>PROSAT=PROcessing system for meteorological SATellite data

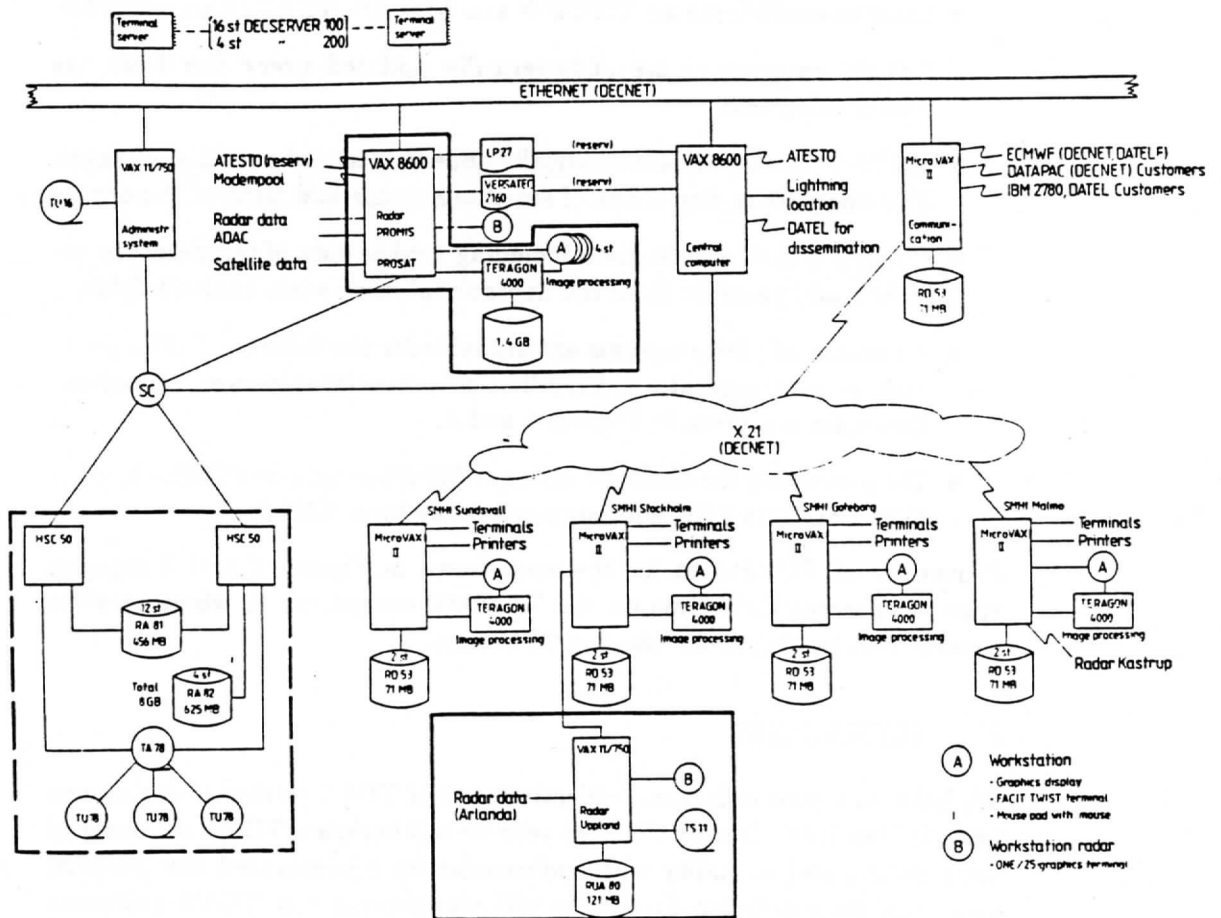


Figure 1: The computer system at SMHI

## 2. REAL-TIME PROCESSING OF TOVS DATA

The satellite data receiving and processing system PROSAT is located at SMHI in Norrköping ( $58^{\circ}N, 16^{\circ}E$ ). PROSAT includes receivers for the polar NOAA-satellites and the geostationary METEOSAT. The host computer for PROSAT is a VAX8600. For each NOAA passage, PROSAT automatically extracts TIP-data from the HRPT Minor Frames (see [11]). The TOVS processing system includes the following facilities:

- Satellite coefficients for TIROS-N and NOAA6-NOAA10 are available.
- Orbital parameters are automatically updated every day from the TBUS telegrams.
- TOVS retrievals are automatically done for selected satellite passages. The selection is dependent of satellite number and time of the day.
- Climate is used as first guess including surface data of temperature, humidity and pressure from the operational meso-scale analysis fields.
- A number of plot programs are available for the different TOVS products, e. g. temperature, humidity, geopotential thickness and ozone. Examples are given in Figures 2 and 3.
- The processing includes the ordinary ITPP4-programs PREING, INGTOV and TOVPRE and our retrieval method THAP.

Processing of TOVS-data for the area shown in Figures 2 and 3 requires appr. 8 minutes CPU-time on the VAX8600 computer. A whole satellite passage requires appr. 20 minutes CPU-time.

## 3. FUTURE PLANS

We have until now only made objective tests of TOVS retrievals during one period; May 1983. During the next year we will compare TOVS retrievals of temperature and humidity with radiosondes for concentrated test periods, using real-time satellite data. We will also present raw TOVS radiances and processed TOVS products on the image processing system of PROSAT. With this image processing system, we are able to combine TOVS data with e. g. forecast fields and AVHRR pictures. These images will be used by the operational forecasters. The usefulness of TOVS images for the operational forecaster will be evaluated.

NOAA10 87-09-04 0645

GT 700/1000	87-09-04-05Z
LAM	VT:08-04-06Z

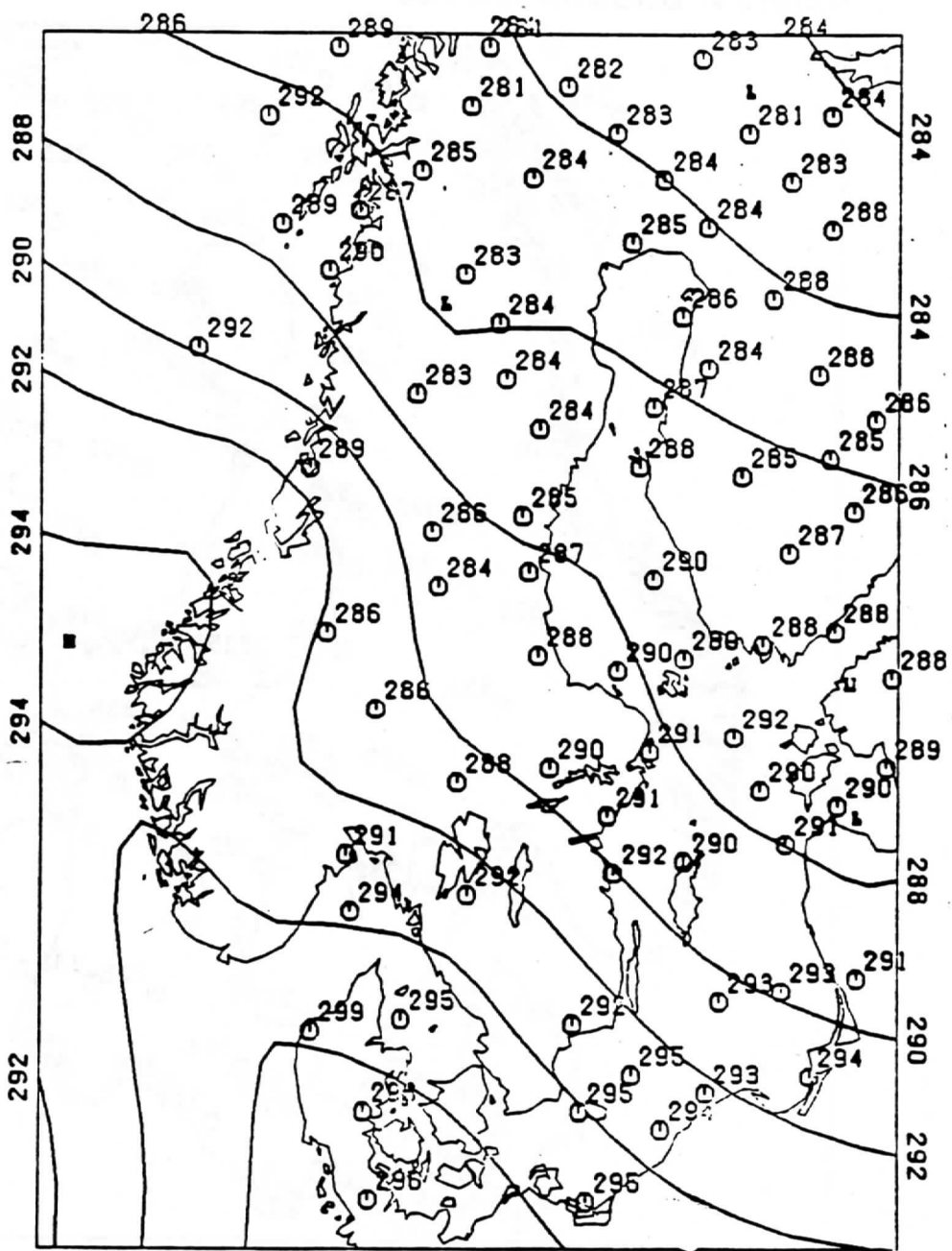


Figure 2: Geopotential thickness 700-1000 hPa. TOVS retrievals compared to the operational LAM-analysis.

NOAA10 87-09-04 0645

Ozone: Dobson units

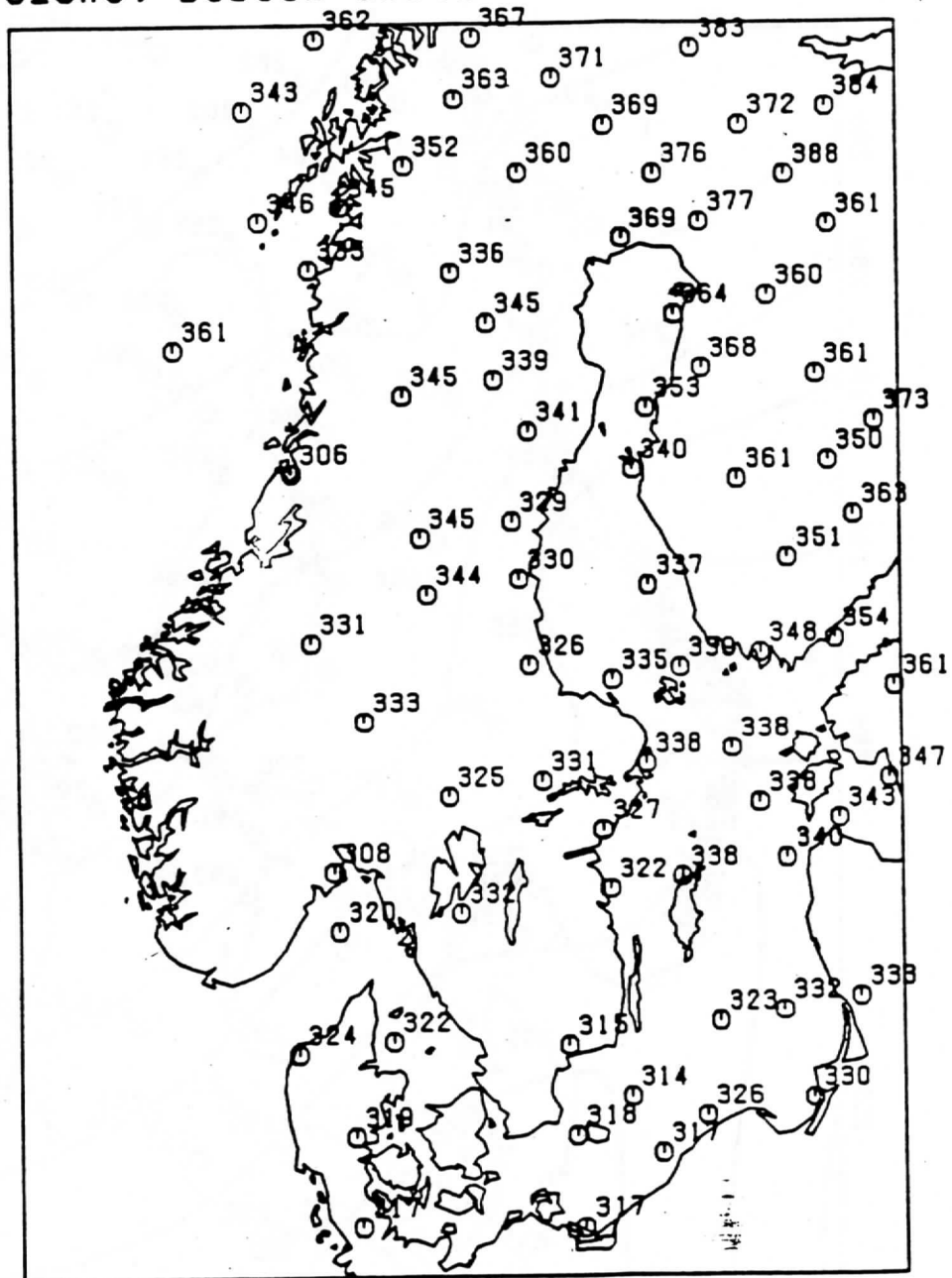


Figure 3: Ozone retrievals from TOVS-data

The work with the integration of TOVS retrievals and HIRLAM data assimilation will continue. The aim is to use TOVS-data operationally in HIRLAM starting in 1989/90.

In June, 1988, NABAS<sup>3</sup> will arrange a symposium in Norrköping on the processing of TOVS-data in Northern latitudes.

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<sup>3</sup>NABAS=working group for the utilization of satellite data with participation from the meteorological institutes in Denmark, Finland, Norway and Sweden.

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