# EXPERIENCES OF ORACLE DATABASE IN FMI

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Summary: This paper describes the structure and properties of ORACLE database taken into use in the beginning of 1991 in Finnish Meteorological Institute (FMI).

## 1. BACKGROUND

In FMI we have had four computerized systems for managing and storing synoptic and climatological data:

1. IBM 650 in the 1960's,
2. DATASAAB D21/22 system in the 1970's,
3. CONTROL DATA / CYBER 730 / TOTAL system in 1980's (the first one based on database) and
4. VAX / VMS / ORACLE/ system from the beginning of 1991.

The oldest data stored into database are from 1950. Bigger step in a number of stations occurs in 1959 and again in 1970, from where so-called precipitation station data on daily basis are taken into our automatic data processing routines. Number of stations in each year is shown in figure 1. Nowadays number of automatic stations is increasing and about 60 automatic stations produce data into the system.

## 2. STRUCTURE OF THE DATABASE

TOTAL / CYBER database management system was partly commercial and partly tailored for our purposes. ORACLE is totally commercial and all the tools used in system managing are from ORACLE. Quite much attention was paid to the structure of different ORACLE database tables. Our aim was to form "user friendly " tables (effective in use and not wasting disc space). Structure of the climatological

ORACLE database in FMI is illustrated in fig. 2. Tables with data increasing continuously are defined so that data of each year are stored into its own table and two last numbers of the year are attached to the table name (for instance DAILY_89).

All data retrievals are based on SQL (Structered Query Language) or other ORACLE tools (SQL*Forms, SQL*Menu, PRO*Fortran, PRO*C). All database files are available interactively.

Database is located in VAX Server 6210. The whole climatological database requires about 3 GB with indexes. SYNOP table increases 33 MB / year, DAILY table 30 MB / year and HRAD table 10 MB / year. As front-end computers we use VAX 3400 / 30 VMS users and VAX 3100 / 10 VMS users. It is possible to link ORACLE for MS-DOS and ORACLE for Macintosh with the main system.

## 3. BENCHMARK RUNS

Our aim was to build a system where all the data are available interactively and certain response times were expected to reach.

a) Data retrievals: 6609 records 2 min 8.15 s, 51.6 records / s (required 40 / s ).
1 record = 6 weather parameters + simple calculations.
b) Loading data into database: 366 records 6.01 s, 60.9 records / s (req. 10 / s ).
4 tables were joined to one table. Result was DAILY table.
c) Response time: all observations from SYNOP table / one observation hour 1.73 s
(median value) (required 4 s)

## 4. EXPERIENCES AND COSTS

Quick summary of advantages and disadvantages:

| Advantages / | disadvantages : |
|---|---|
| - all the data is available interactively | - "why don't they use SQL ?" |
| - user friendly updating (SQL*Forms) | - how to get trained people ? |
| - what you see - there it is ! | - compiling & linking Fortran |
| - fast when not rush hour | - slow when rush hour |
| - standard deviations, averages, sums etc. | - SQL can calculate only simple |
| - easy to form and update your own tables | calculations (version 7 can ?!) |

- system support

- very large queries may jam the system

Quite much money was spent for training people to use ORACLE tools. Timing in training was difficult because people lived with the old system and they didn't start working immediately with the new system.

Consultant work took about 6 months full-day job.

| | | |
|---|---|---|
| Lisencies for VAX computers: | | 60 400 £ |
| Lisencies for microcomputers: | | 32 650 £ |
| Training and education: | | 45 200 £ |
| Consultant work: | | 65 900 £ |
| | | ======= |
| | Total | 204 150 £ |

NUMBER OF STATIONS 1950 - 1989

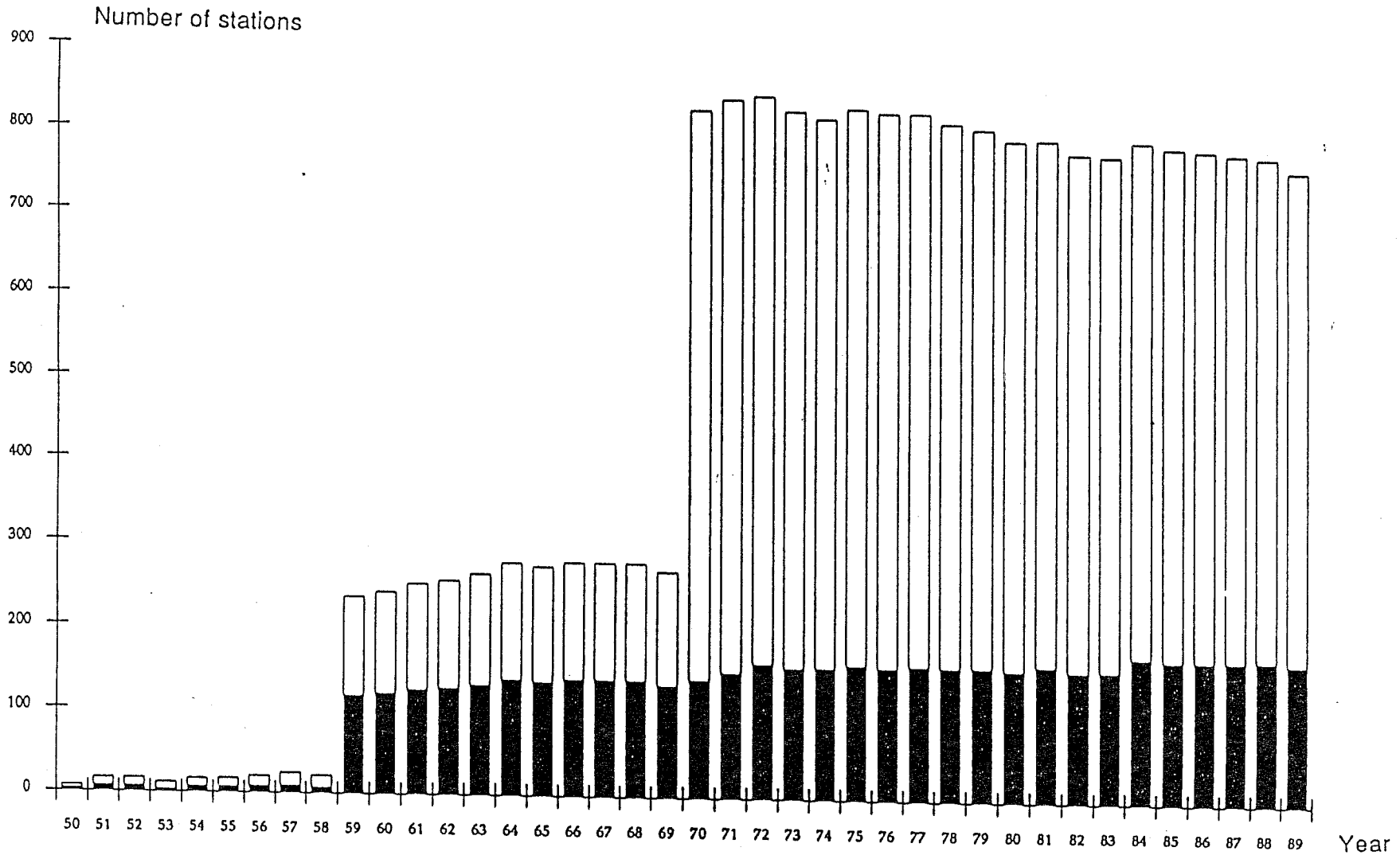


Figure 1. Black bars indicate number of stations whose data are stored into SYNOP table
(i.e. synoptic and climatological stations).
White bars indicate number of stations observing as a minimum requirement precipitation
(i.e. synoptic + climatological + precipitation stations).

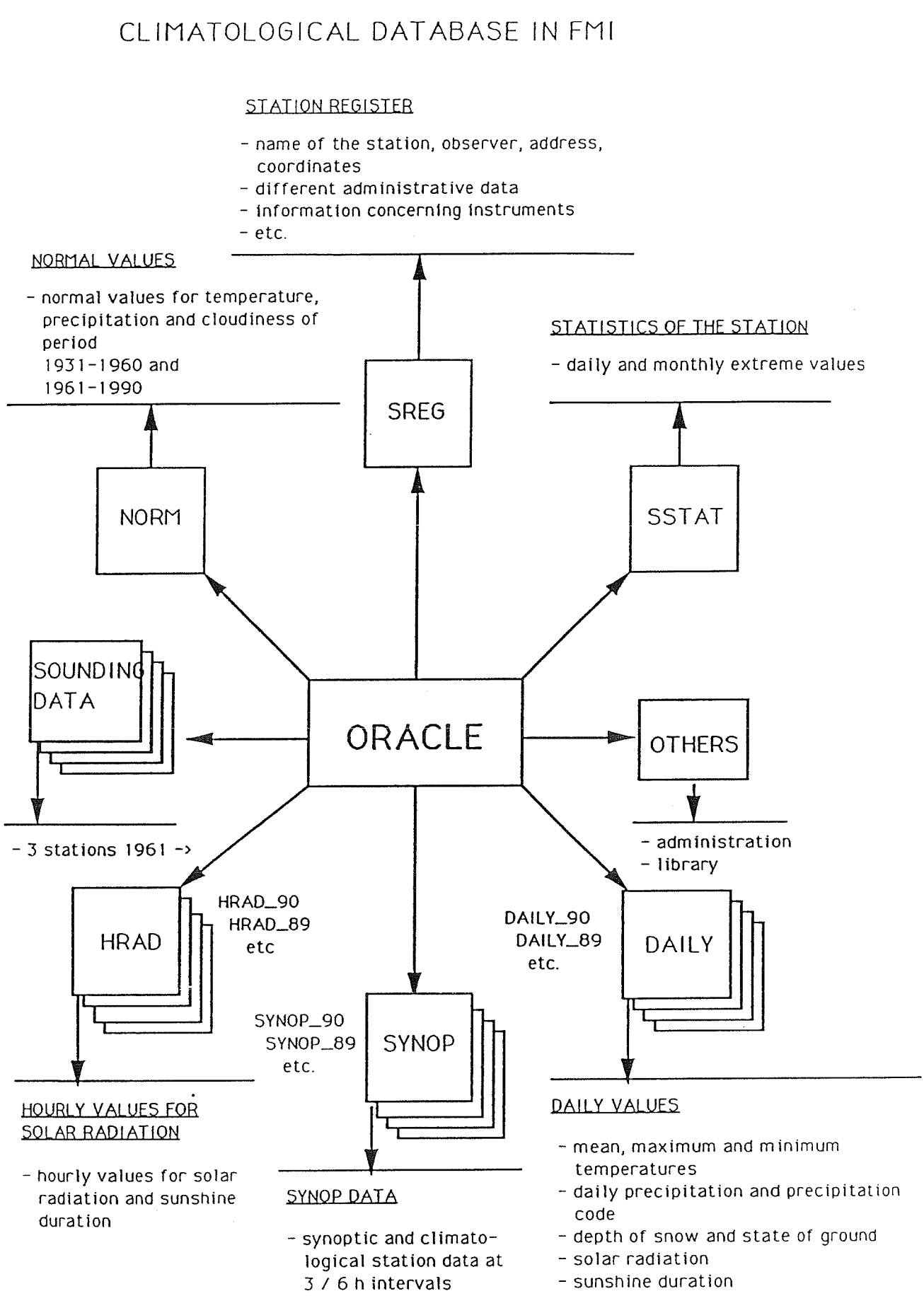


Figure 2. Different tables of the climatological database