



NORSAR Scientific Report No. 1-2001

Technical Summary

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6.5 Online databases for the European Arctic — New developments of the NORSAR web site

6.5.1 Introduction

In September 1998 a new version of the software used for analyzing regional seismic events was installed at NORSAR. From 10 November 2000 all waveform data from the available arrays (NOA, NORES, ARCES, SPITS, HFS, FINES, and Apatity) have been stored on disk for subsequent rapid access. Together with this we have also upgraded NORSAR's Web site to include both epicenter maps, event information with phase readings, and standard waveform plots of the Reviewed Regional Seismic Bulletin. For the time period preceding 10 November 2000 the waveform plots are not included. The main motivation for this work has been to facilitate the combined use of the reviewed bulletin information and online data for research purposes. The information available on the Internet is updated as events are analyzed, typically several times a month.

Fig. 6.5.1 shows the starting calendar view found on NORSAR's Web site (<http://www.norsar.no/>). By clicking on the selected month, a map and list of the events within this period is displayed, as shown in Fig. 6.5.2.

6.5.2 NORSAR's Analyst Reviewed Regional Seismic Bulletin

The starting point for the analyst review are the locations and magnitudes provided by NORSAR's fully automatic bulletin generated by the Generalized Beamforming method (Kværna et al., 1999). The analyst is focusing on regional events with magnitude greater than 1.5, but also other events of interest in the European Arctic are included in the reviewed bulletin.

Fig. 6.5.2 shows an example from March 2001 of the monthly analyst reviewed results, with a map and list of the locations, magnitude, region and some information on residuals and number of stations and phases. Using data from the regional arrays NORES, ARCES, HFS, FINES, Apatity, and SPITS, an average of about 90 events are analyzed every month. Pages covering four sub-regions are available by clicking on the map, Fig. 6.5.3. shows the Northern Norway/Kola Peninsula page for March 2001. Detailed data about single events are available by clicking on the Origin ID (Orid) in the lists, as shown in Fig. 6.5.4. This consists of a detailed location map with error ellipse, more detailed hypocenter location information and also phase arrival data used in the location. Waveform data plots from the stations used in the location are available, and are shown in a pop-up window. Waveform data examples are shown in Fig. 6.5.5.

6.5.3 Near-real-time data plots

A method for quickly viewing seismic data has been developed for NORSAR's web site. Each plot contains one full day of data from the vertical component of the central instrument within each array, filtered to enhance regional and local arrivals. These "virtual helicorder plots" are updated every fifteen minutes, and older plots are archived for later retrieval, as shown in Fig. 6.5.6. Data going back to 24 January 2001 are currently available. Sample plots for 31 March 2001 from NORES and 31 May from ARCES are shown in Fig. 6.5.7.

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References

Kværna, T., J. Schweitzer, L. Taylor and F. Ringdal (1999). Monitoring the European Arctic using Regional Generalized Beamforming. In: NORSAR Semiannual Tech. Sum. 1 October 1998 - 31 March 1999, NORSAR Sci. Rep. 2-98/99, Kjeller, Norway, 78-94.

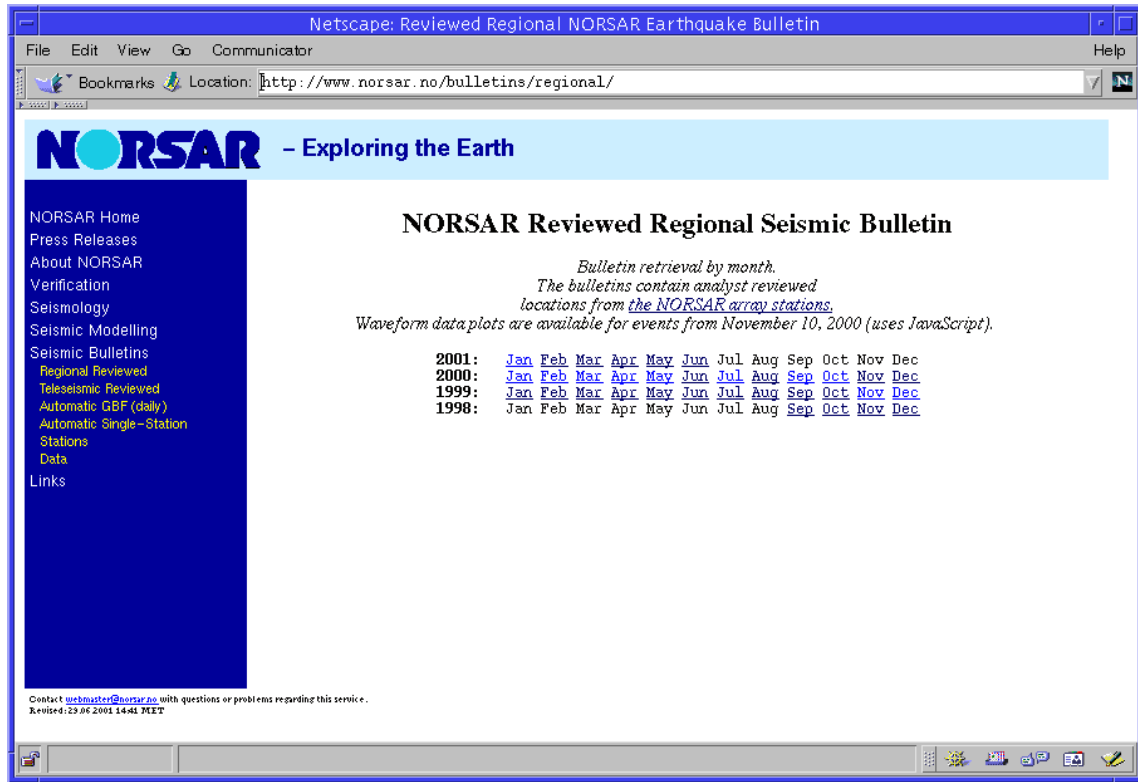


Fig. 6.5.1. Start page calendar for NORSAR’s online Reviewed Regional Seismic Bulletin.

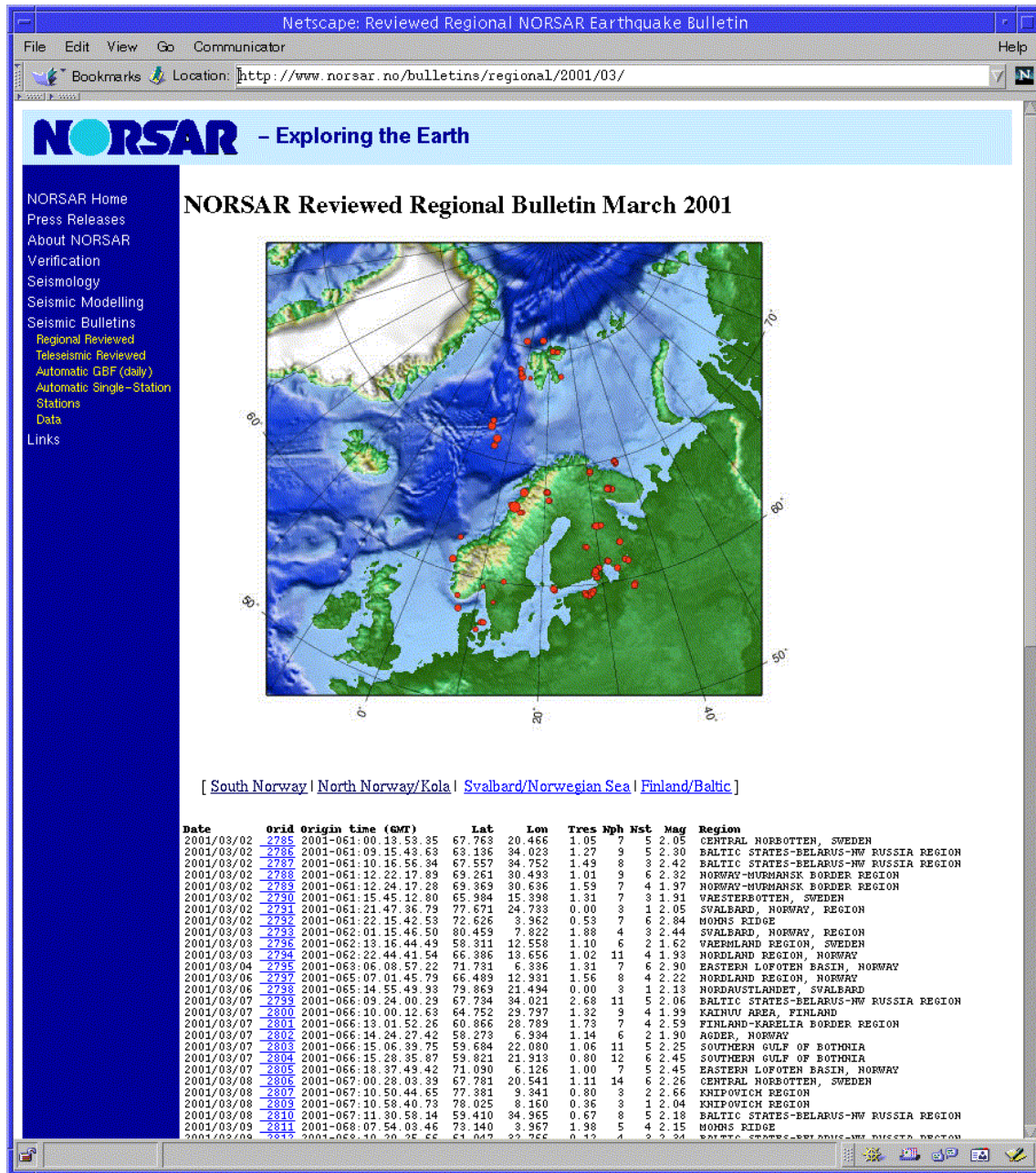


Fig. 6.5.2. Locations of events in NORSAR's Analyst Reviewed Regional Seismic Bulletin for March 2001. Using data from the regional arrays NORES, ARCES, HFS, FINES, Apatity, and SPITS, an average of about 90 events are analyzed every month. Below the map with events follows a summary list with the basic event information (Origin Time, Origin ID, Location, No. of phases/stations, Magnitude and Region). The following figures further illustrate the structure of this Web application (Figs. 6.5.3-6.5.5).

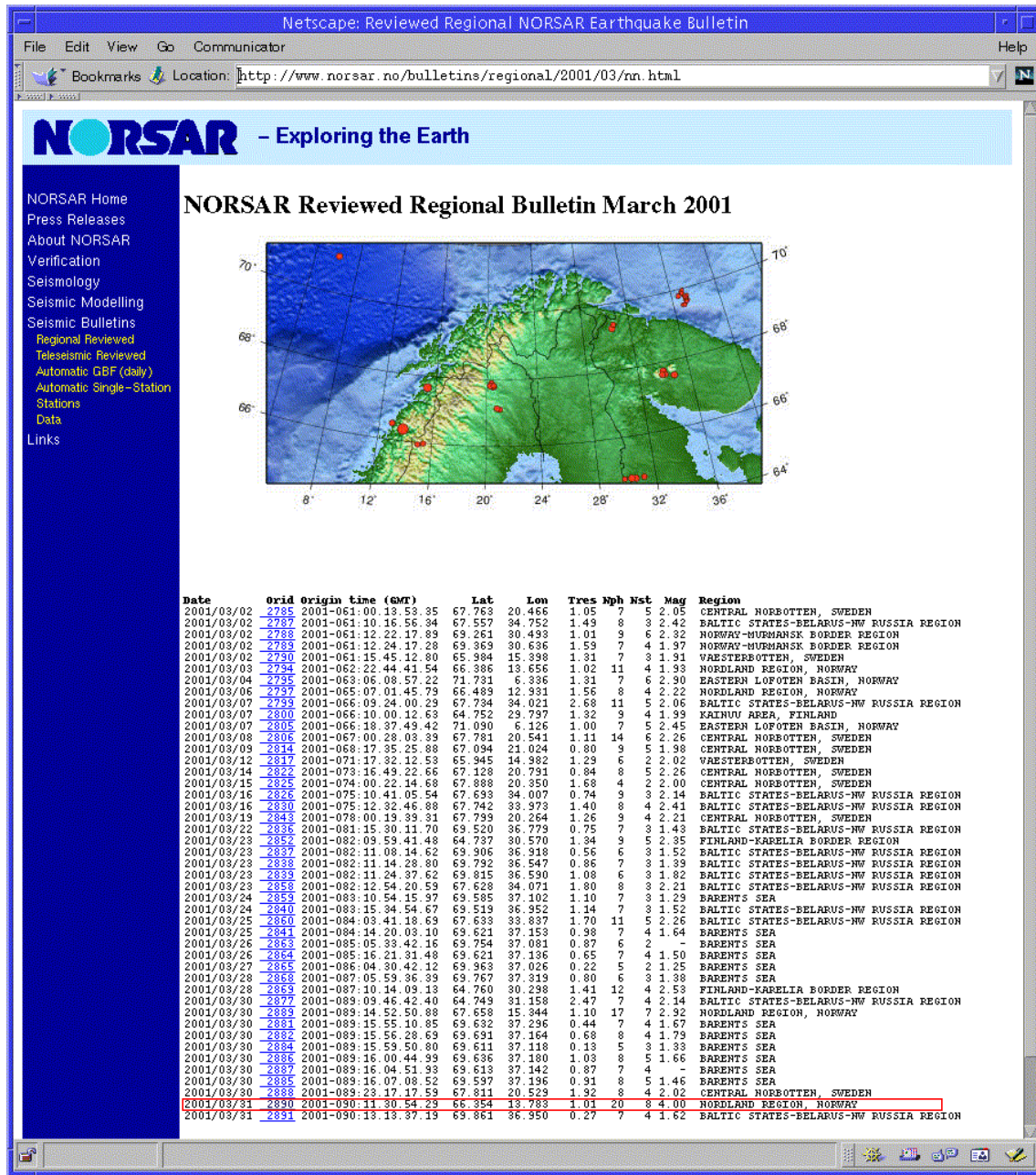


Fig. 6.5.3. Zoom of the events in Northern Norway and on the Kola Peninsula. More information on each event can be found by mouse clicking on the Origin Id (Orid). Details concerning the highlighted event (Orid. 2890) are shown in Fig. 6.5.4.

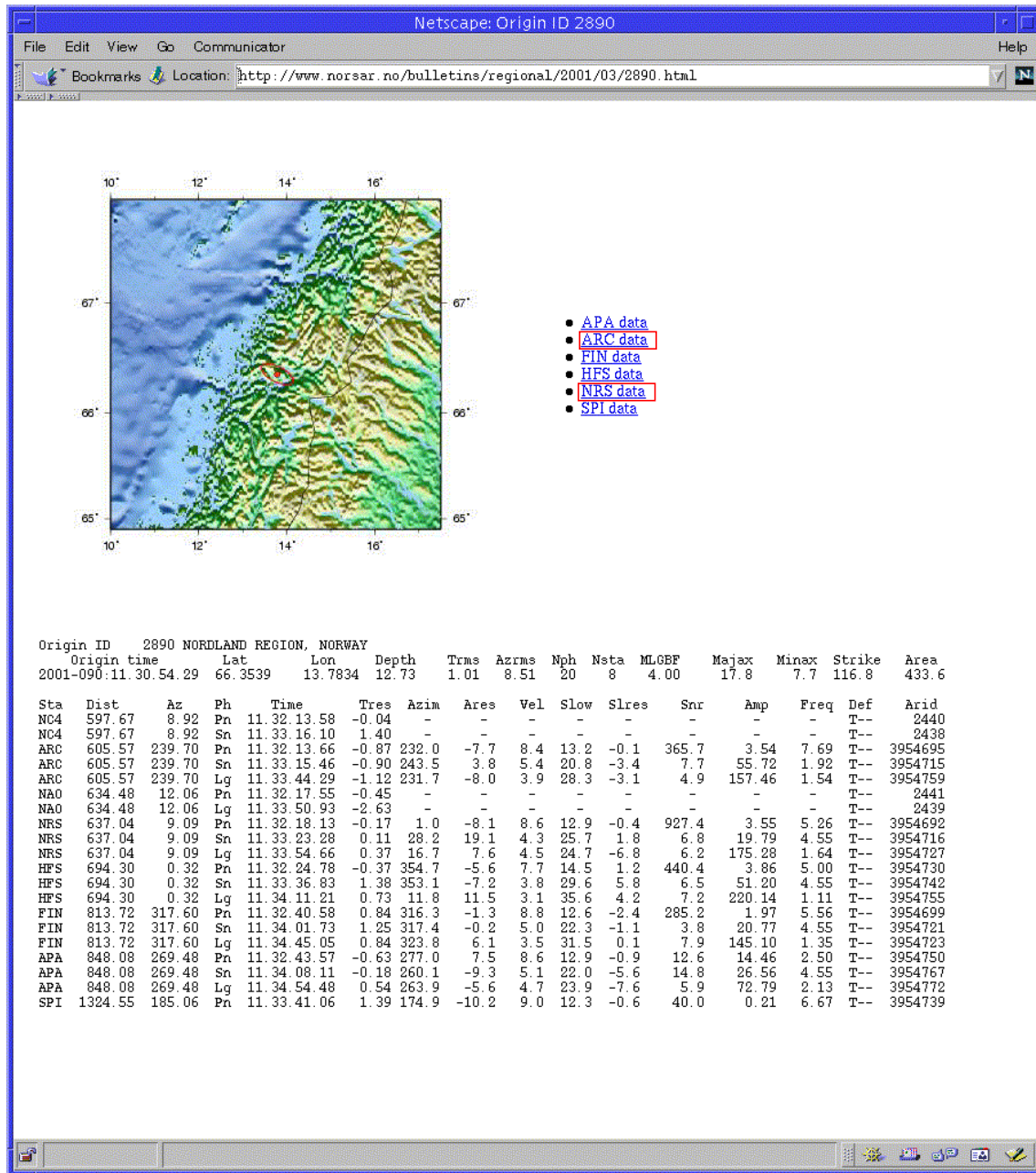


Fig. 6.5.4. Detailed information page for Orid 2890, 31 March 2001. This is an earthquake in the Mo i Rana area in Nordland. Below the high resolution map showing the event location and the associated error ellipse, detailed bulletin information for this event, including the phase readings are listed. For each station used in the event location a station field is displayed to the right of the map. By clicking on a station field, the station waveforms for the given event will be shown in a popup window. Waveform plots from the highlighted ARCES (ARC) and NORES (NRS) stations are shown in Fig. 6.5.5.

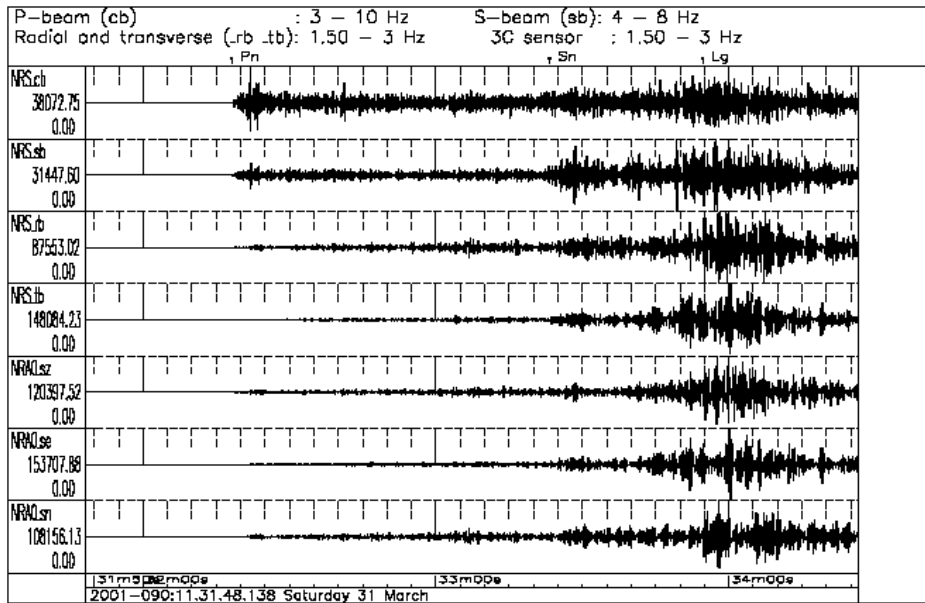
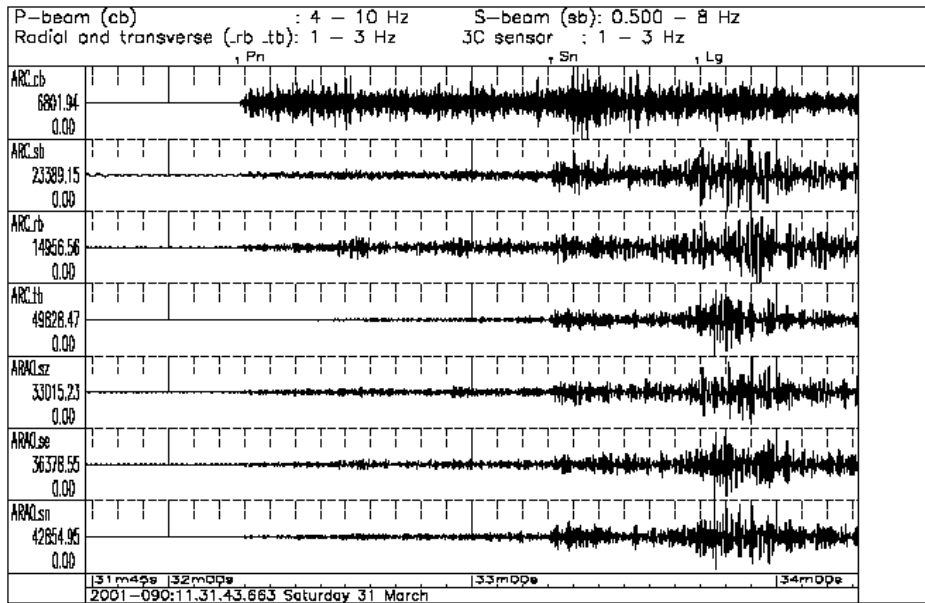


Fig. 6.5.5. ARCES (top) and NORES (bottom) waveforms for Orid 2890. The small markers on top of the plots show the analyst reviewed phase readings. The traces correspond to various array beams and single channels, and have been filtered with bandpass filters designed to enhance various phases. The top trace is a P-type beam focusing on the first arrivals. The second trace is an S-type beam, and traces nos. 3 and 4 are the radial and transverse components, both focusing on the S-phases. The three lower traces show the data of the three-component sensor located centrally within the arrays. The individual filter parameters as shown are adapted depending on event size, distance etc. for each type of trace.

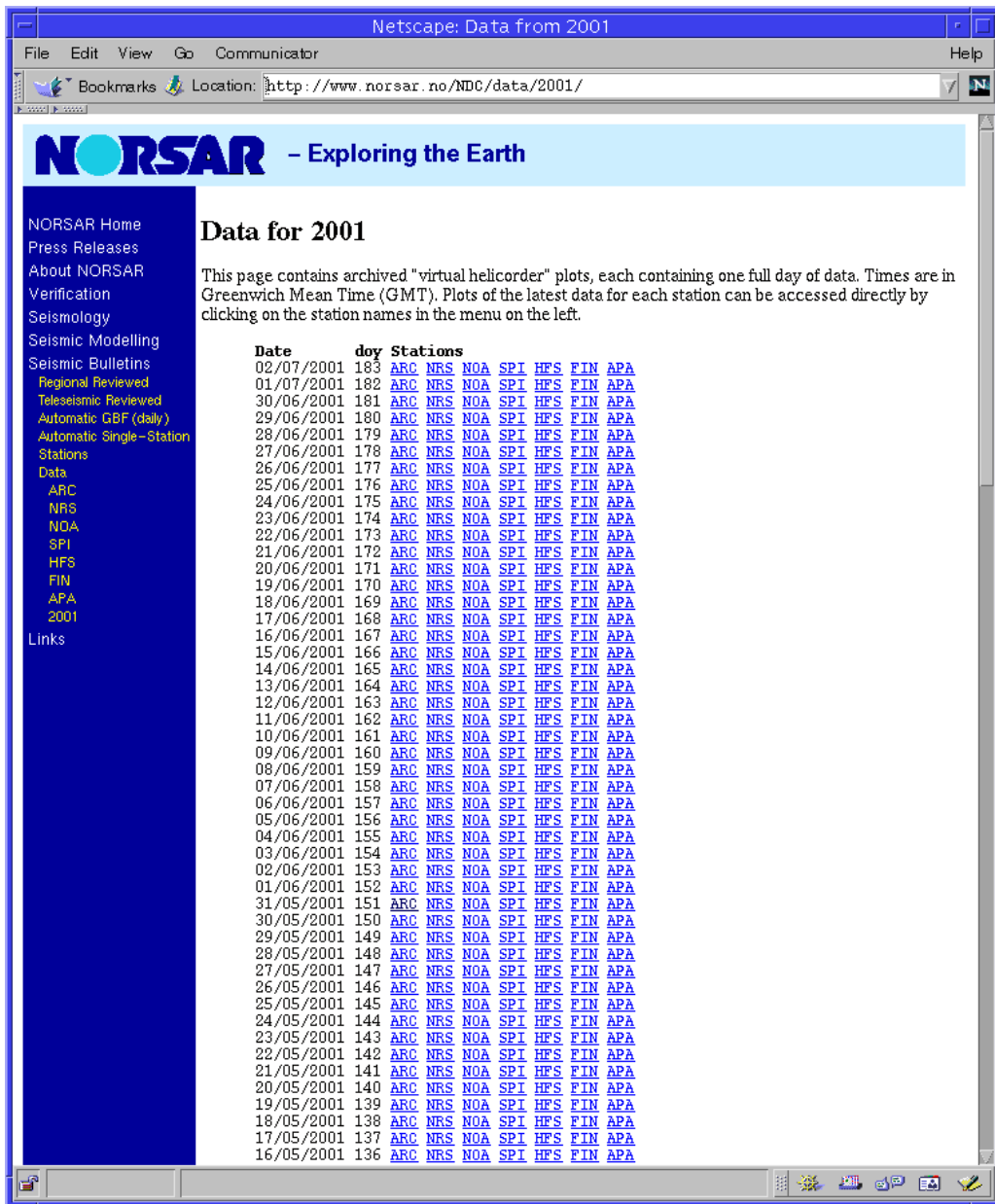


Fig. 6.5.6. The calendar file for accessing archived data plots for each station.

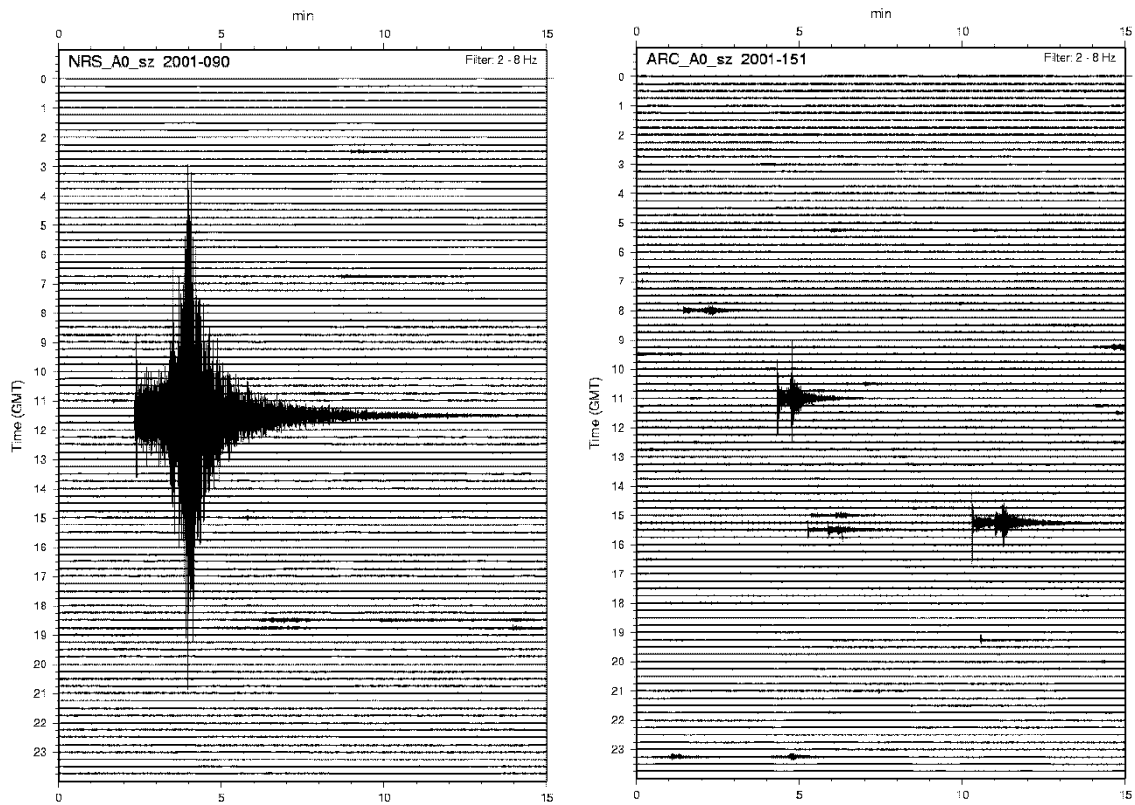


Fig. 6.5.7. Sample “virtual helicorder plots” from NORES for 31 March 2001 (left) showing a relatively large (M_L 4.0) earthquake at a distance of 635km, and from ARCES for 31 May 2001 (right) showing several small local and regional seismic events.