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7.1 Status Report: Norway's participation in GSETT-3

Introduction

This contribution is essentially an update for the period April - September 1997 of the three status reports Mykkeltveit & Baadshaug (1996a), Mykkeltveit & Baadshaug (1996b) and Baadshaug & Mykkeltveit (1997) which cover the periods January 1995 - June 1996, April 1996 - September 1996 and October 1996 - March 1997, respectively.

Norwegian GSETT-3 stations and communications arrangements

From the second half of 1993 until 1 October 1996, Norway provided continuous data from three GSETT-3 primary array stations: ARCESS, NORESS and Spitsbergen. The location and configurations of these three stations are shown in Fig. 7.1.1. ARCESS and NORESS are 25-element arrays with identical geometries and an aperture of 3 km, whereas the Spitsbergen array has 9 elements within a 1-km aperture. All three stations have a broadband three-component seismometer at the array center.

Data from these three stations are transmitted continuously and in real time to NOR_NDC. The NORESS data transmission uses a dedicated 64 Kbits/s land line, whereas data from the other two arrays are transmitted via satellite links of capacity 64 Kbits/s and 19.2 Kbits/s for the ARCESS and Spitsbergen arrays, respectively. From the NOR_NDC, data have been forwarded to the prototype IDC (PIDC) in Arlington, Virginia, USA, via a dedicated fiber optical 256 Kbits/s link between the two centers.

The NORESS array has been used in GSETT-3 as a temporary substitute for the NORSAR teleseismic array (also shown in Fig. 7.1.1; station code NOA), awaiting a complete technical refurbishment of the latter. This effort has now been completed, and starting 30 August 1996, data from the NORSAR array have been transmitted continuously to the PIDC. Subject to funding, the NORESS array will, however, be retained as a GSETT-3 primary station hopefully until such time that the NORSAR array data are fully used in the PIDC operational processing cycle. We are cooperating with the PIDC on the task of preparing for the processing of NORSAR data at the PIDC (see section 7.4 of this report). Some Testbed processing of NORSAR data has been performed. The purpose of the PIDC Testbed is to facilitate integration testing and therefore minimize disruption to the operational system.

On 1 October 1996 numerous changes were made worldwide to the GSETT-3 network. The purpose of these coordinated changes was to bring the GSETT-3 network in line with the seismic component of the International Monitoring System (IMS) to the extent possible. As the Spitsbergen array is an auxiliary station in IMS, this station changed its status from primary to auxiliary in GSETT-3 on that date. This involved terminating the continuous forwarding of SPITS data to the PIDC and making data from this station available to the PIDC on a request basis via the AutoDRM protocol (Kradolfer, 1993; Kradolfer, 1996). The other stations named above have continued providing continuous data to the PIDC, in agreement with their status as primary seismic stations in the IMS.

Uptimes and data availability

Figs. 7.1.2 - 7.1.4 show the monthly uptimes for the two Norwegian GSETT-3 primary stations ARCESS, NORESS and for the testbed primary station NOA, respectively, for the period April - September 1997, given as the hatched (taller) bars in these figures. These barplots reflect the percentage of the waveform data that are available in the NOR_NDC tape archives for each of these three stations. The downtimes inferred from these figures thus represent the cumulative effect of field equipment outages, station site to NOR_NDC communication outages and NOR_NDC data acquisition outages. The ARCESS downtime during June-August (Fig. 7.1.2) was due to damage caused by overvoltage. Reinstallation was completed on 28 August.

Figs. 7.1.2-7.1.4 also give the data availability for these three stations as reported by the PIDC in the PIDC Station Status reports. The main reason for the discrepancies between the NOR_NDC and PIDC data availabilities as observed from these figures is the difference in the ways the two data centers report data availability for arrays: Whereas NOR_NDC reports an array station to be up and available if at least one channel produces useful data, the PIDC uses weights where the reported availability (capability) is based on the number of actually operating channels. As can be seen from these figures, these differences in the reporting practice in particular affect the results for the NORESS and NOA arrays.

Experience with the AutoDRM protocol

NOR_NDC's AutoDRM has been operational since November 1995 (Mykkeltveit & Baadshaug, 1996a).

Between November 1995 and the network changes on 1 October 1996, only 207 requests from external users were processed.

After SPITS changed station status from primary to auxiliary on 1 October 1996, the request load increased sharply, and for the month of October 1996, the NOR_NDC AutoDRM responded to 12338 requests for SPITS waveforms from two different accounts at the PIDC: 9555 response messages were sent to the "pipeline" account and 2783 to "testbed". Following this initial burst of activity, the number of "pipeline" requests stabilized at a level between 5000 and 7000 per month. Requests from the "testbed" account show large variations.

The monthly number of requests for SPITS data for the period April - September 1997 is shown in Fig. 7.1.5.

NDC automatic processing and data analysis

These tasks have proceeded in accordance with the descriptions given in Mykkeltveit and Baadshaug (1996a). For the period April - September 1997, NOR_NDC derived information on 921 supplementary events in northern Europe and submitted this information to the Finnish NDC as the NOR_NDC contribution to the joint Nordic Supplementary (Gamma) Bulletin, which in turn is forwarded to the PIDC. These events are plotted in Fig. 7.1.6.

Data forwarding for GSETT-3 stations in other countries

NOR_NDC continues to forward data to the PIDC from GSETT-3 primary stations in several countries. These currently include FINESS (Finland), GERESS (Germany) and Sonseca (Spain). In addition, communications for the GSETT-3 auxiliary station at Nilore, Pakistan, are provided through a VSAT satellite link between NOR_NDC and Pakistan's NDC in Nilore. Data from the Hagfors array (HFS) in Sweden were provided continuously through NOR_NDC until 1 October 1996, on which date this station changed its status in GSETT-3 from primary to auxiliary, in accordance with the status of HFS in IMS. From 1 October 1996, the PIDC obtains HFS data through requests to the AutoDRM server at NOR_NDC (in the same way requests for Spitsbergen array data are handled, see above). Fig. 7.1.7 shows the monthly number of requests for HFS data from the two PIDC accounts "pipeline" and "test-bed".

Future plans

NOR_NDC will continue the efforts towards improvements and hardening of all critical data acquisition and data forwarding hardware and software components, so as to meet requirements related to operation of IMS stations to the maximum extent possible.

The PrepCom has tasked its Working Group B with overseeing, coordinating and evaluating the GSETT-3 experiment until the end of 1998. The PrepCom has also encouraged states that operate IMS-designated stations to continue to do so on a voluntary basis and in the framework of the GSETT-experiment until such time that the stations have been certified for formal inclusion in IMS. In line with this, we envisage continuing the provision of data from Norwegian IMS-designated stations without interruption to the PIDC, and later on, following certification, to the IDC in Vienna, via the new global communications infrastructure currently being elaborated by the PrepCom.

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S. Mykkeltveit

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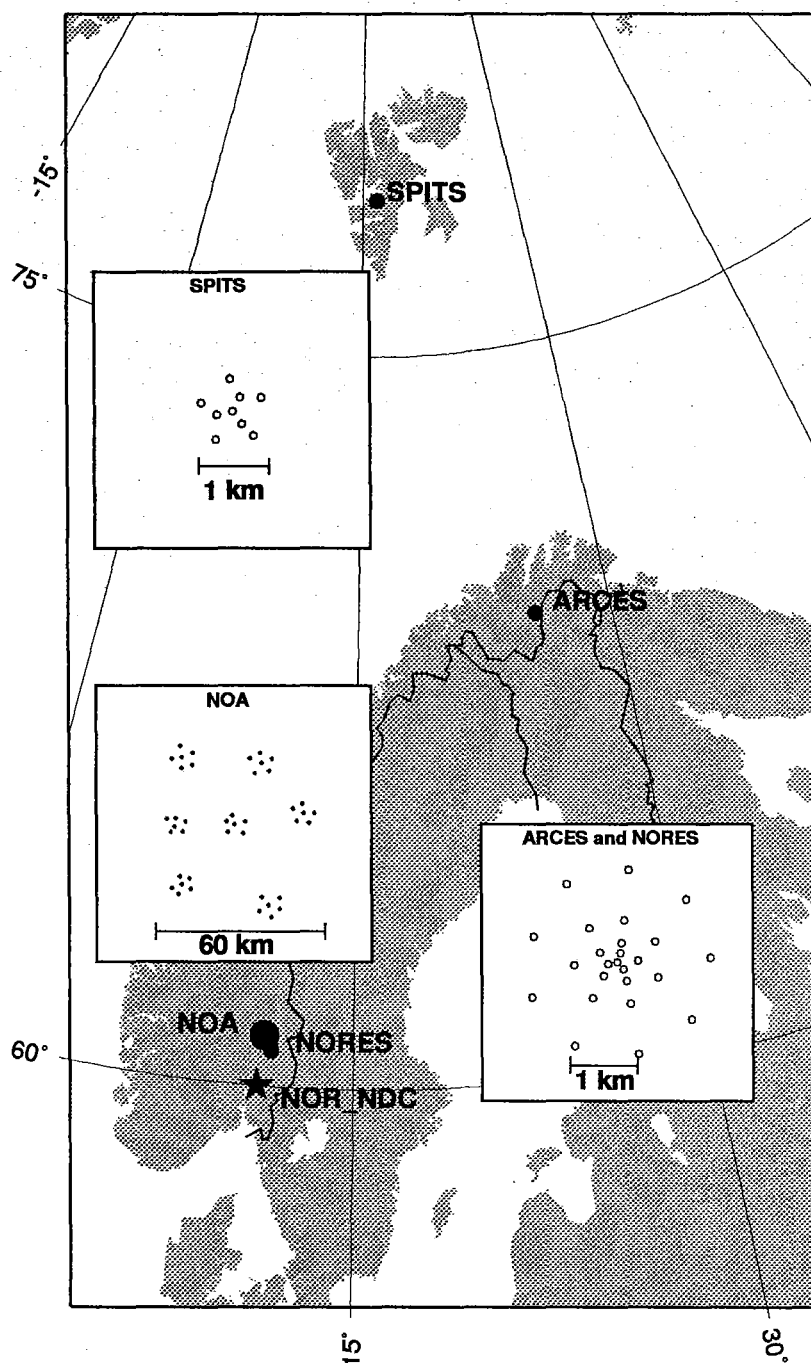


Fig. 7.1.1. The figure shows the locations and configurations of the two Norwegian GSETT-3 primary array stations with station codes NORES and ARCES. The data from these stations are transmitted continuously and in real time to the Norwegian NDC (NOR_NDC) and then on to the prototype IDC. The figure also shows the location of the testbed primary station NOA, which is soon to be fully used in GSETT-3 as a primary station. The auxiliary station SPITS is also shown in the figure.

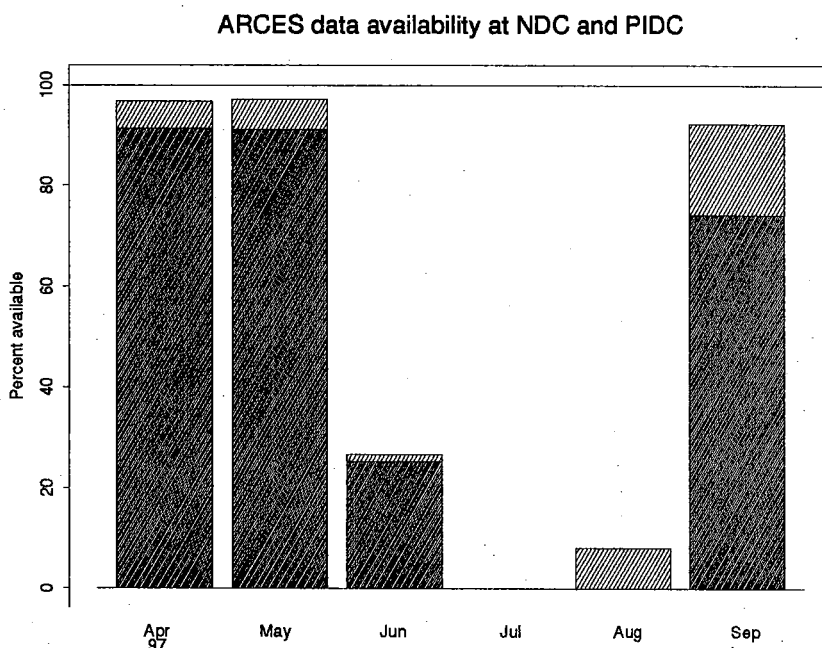


Fig. 7.1.2. The figure shows the monthly availability of ARCESS array data for the period April - September 1997 at NOR_NDC and the PIDC. See the text for explanation of differences in definition of the term "data availability" between the two centers. The higher values (hatched bars) represent the NOR_NDC data availability. The downtimes during June-August were due to overvoltage that caused severe damage to numerous components of the field system. Reinstallation was completed on 28 August.

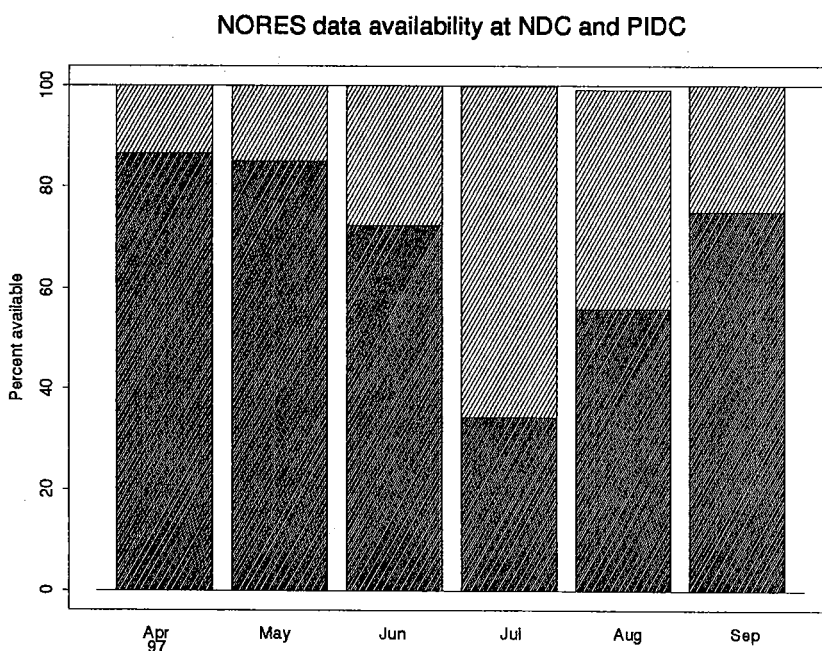


Fig. 7.1.3. The figure shows the monthly availability of NORESS array data for the period April - September 1997 at NOR_NDC and the PIDC. See the text for explanation of differences in the definition of the term "data availability" between the two centers. The higher values (hatched bars) represent the NOR_NDC data availability.

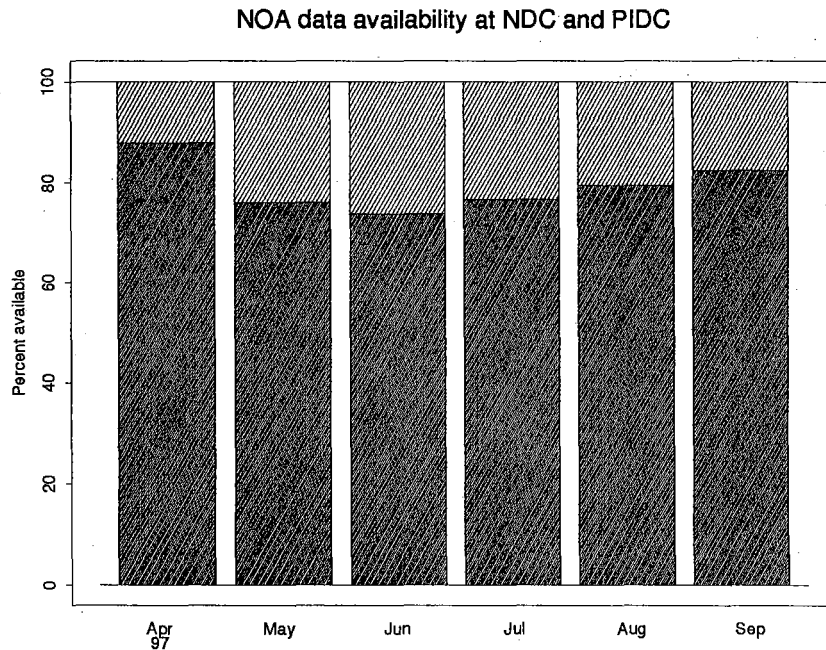


Fig. 7.1.4. The figure shows the monthly availability of NORSAR array data for the period April - September 1997 at NOR_NDC and the PIDC. See the text for explanation of differences in definition of the term "data availability" between the two centers. The higher values (hatched bars) represent the NOR_NDC data availability.

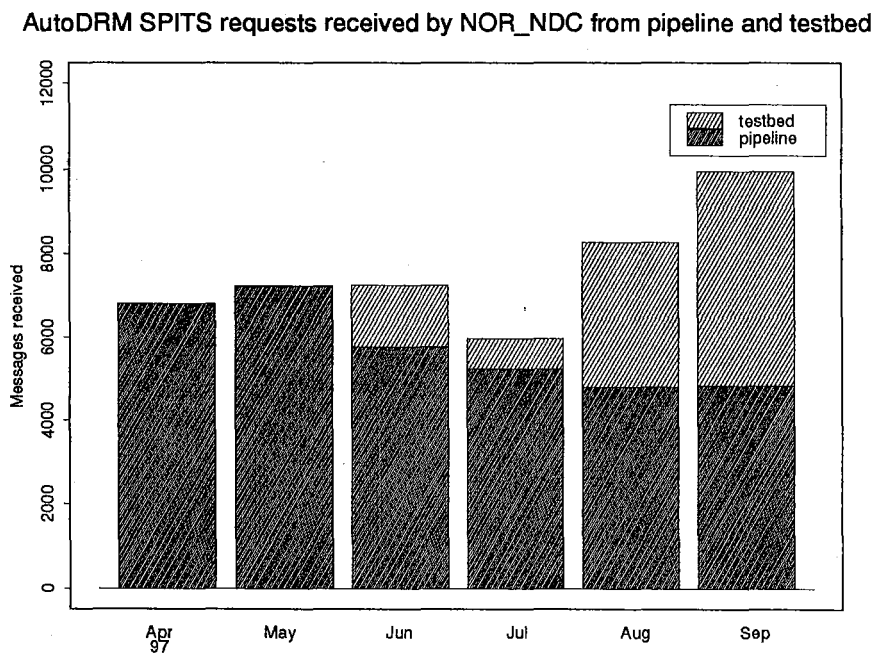


Fig. 7.1.5. The figure shows the monthly number of requests received by NOR_NDC from the PIDC for SPITS waveform segments.

Reviewed Supplementary Events

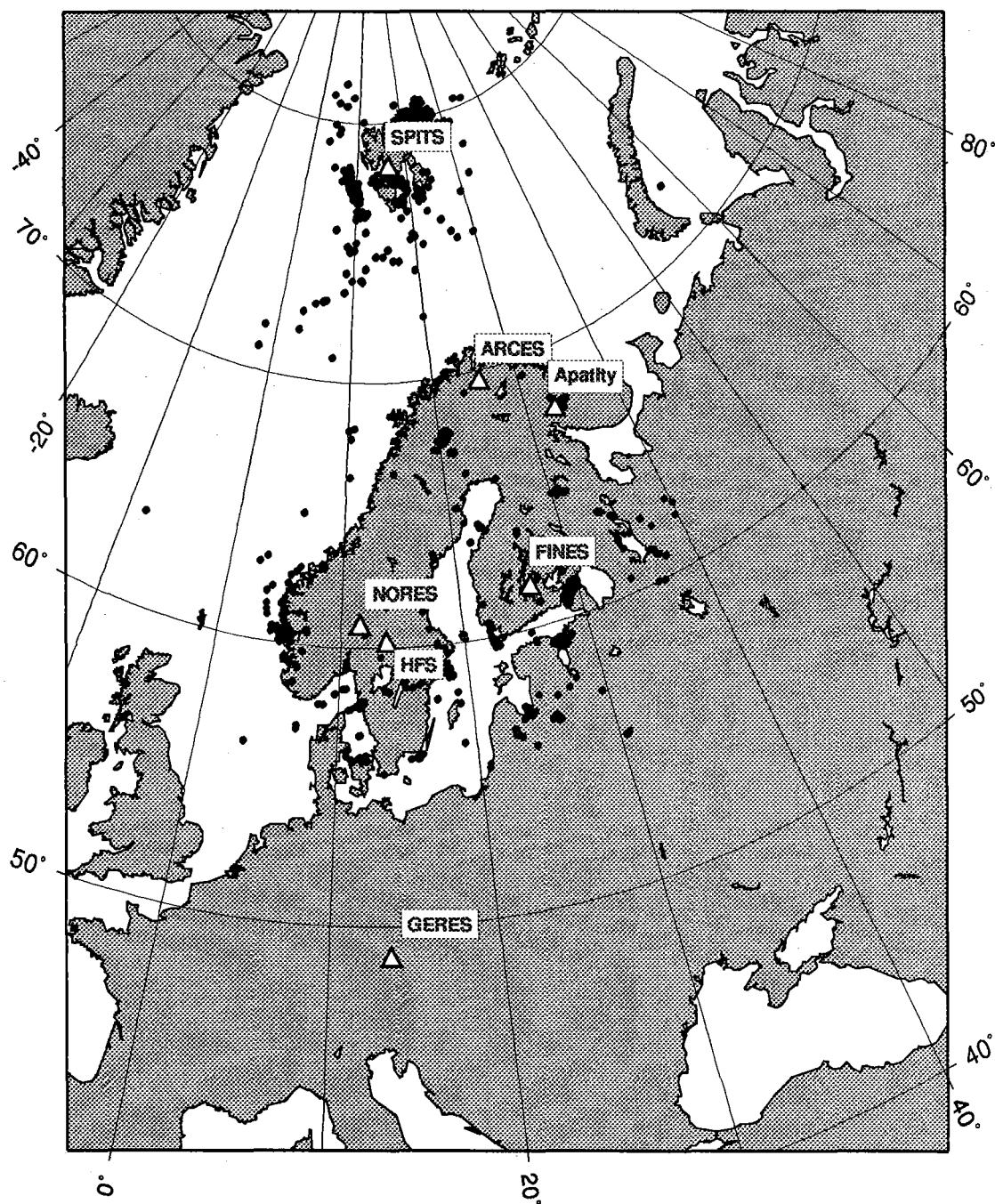


Fig. 7.1.6. The map shows the 921 events in and around Norway contributed by NOR_NDC during April - September 1997 as Supplementary (Gamma) data to the PIDC, as part of the Nordic Supplementary data compiled by the Finnish NDC. The map also shows the seismic stations used in the data analysis to define these events.

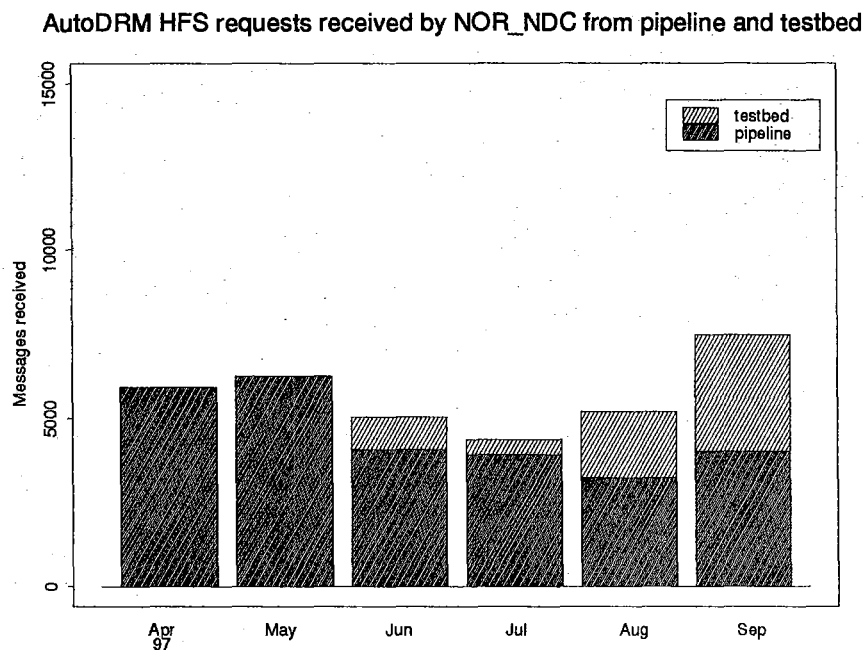


Fig. 7.1.7. The figure shows the monthly number of requests received by NOR_NDC from the PIDC for HFS waveform segments.