8. LOCAL ICE FORCE DATA

As mentioned in Chapter 2 the aim of the program for sampling local ice pressure data by means of the panel system was to study the ice pressure distribution in space and time and to correlate time-histories of local pressure with those of global forces. In particular, the intention was to test the hypothesis presented as a result of the Phase 1 study, that this space-and-time distribution of the contact pressure is the prime explanation of the resonance phenomenon as well as, relating to the same mechanism, of the size dependence of observed "effective" ice pressures.

Since no data could be sampled after 1989, the only available basis for progress in the intended direction is the data collection from the March-April 1989, presented in HSVA's Report No 201/90 from March 1990 [Ref 3]. A considerable amount records of ice forces on the three panels was sampled during the period March 24 until April 20. The ice conditions had been investigated as late as on the 23rd of March, when the ice was already moving.

Unfortunately, the ice conditions were such, during the whole measurement period, that fully developed resonance vibrations did not occur. Furthermore, since springtime conditions were prevailing the ice was rather porous already in the beginning of the period and the ice conditions changed fairly much during the period. Therefore, the character of the ice force records is much more heterogeneous and diffuse than could be expected on the basis of experience from previously sampled global ice force records from periods of more homogenous conditions.

However, even this observation has a certain value and may be regarded as another manifestation of the randomness of the ice pressure.

Examples of records from 1989 are shown in Figures 8:1 - 8:3. The records shown in Figures 8:1 and 8:2 are typical for the most common situations when the ice is indented by a structure which does not move periodically. As pointed out in HSVA's report, the independence in time of the peak forces on the three panels is obvious.

However, although most of the records have this character and there are no records of typical resonance character, the records shown in Figure 8:3 indicate a tendency of resonance ice-structure interaction during a few seconds, with a predominant frequency around 2.3 Hz which is that of the fundamental mode of the lighthouse. In these records the peak forces on the two most affected panels are also more correlated in time than in other records, although the correlation only indicates a slight resonance.

Other conclusions can probably be drawn from this collection of local ice force records, but as regards the main objective of the present study,

we can only conclude that the indications mentioned above provide some additional support to the hypothesis regarding the space-and-time distribution of the ice pressure and its importance to the explanation of resonance and other phenomena. However, more data must be sampled, before any definite conclusions can be drawn.

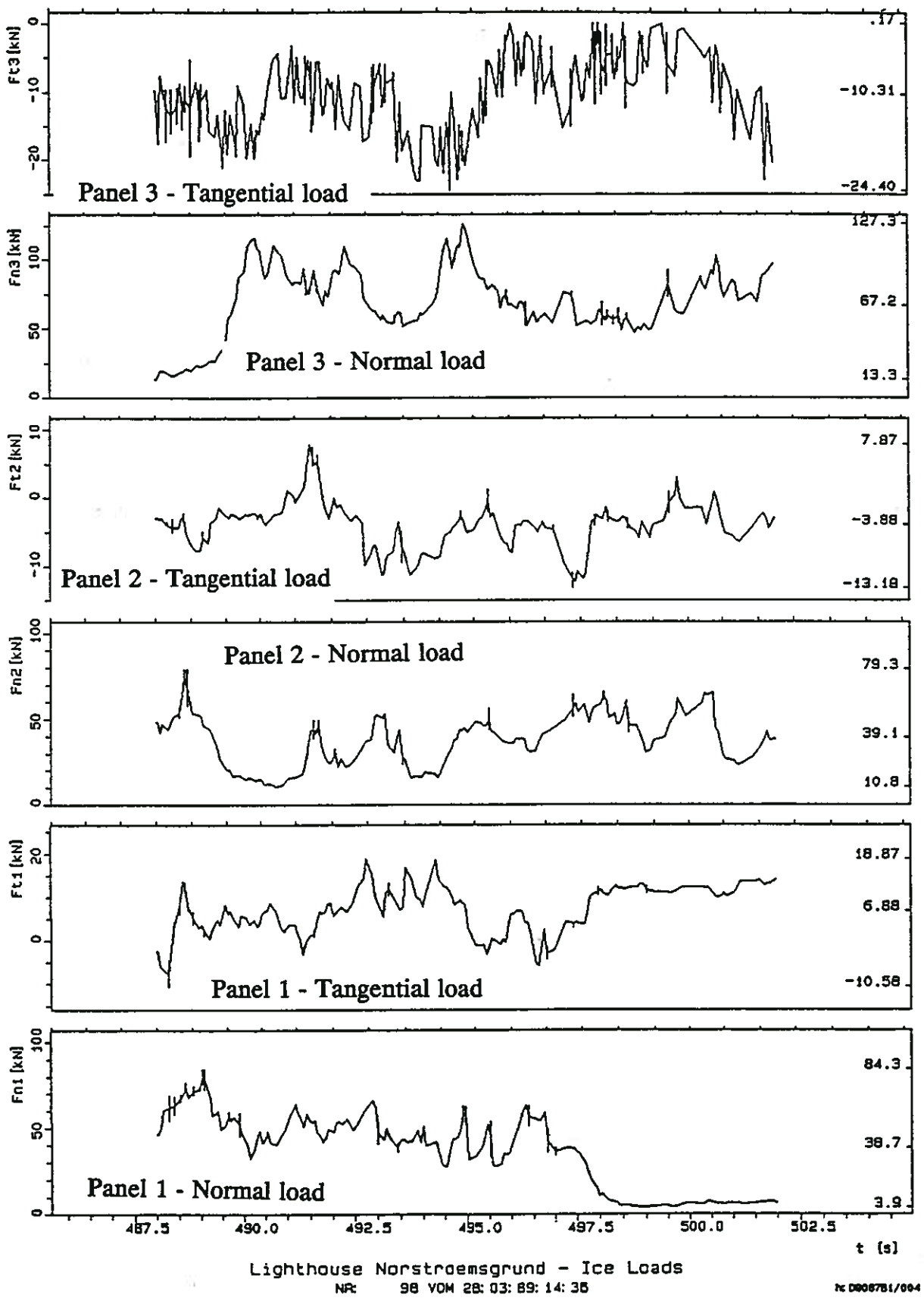

Figure 8:1
Ice force sensing panel records from March 28, 1989.

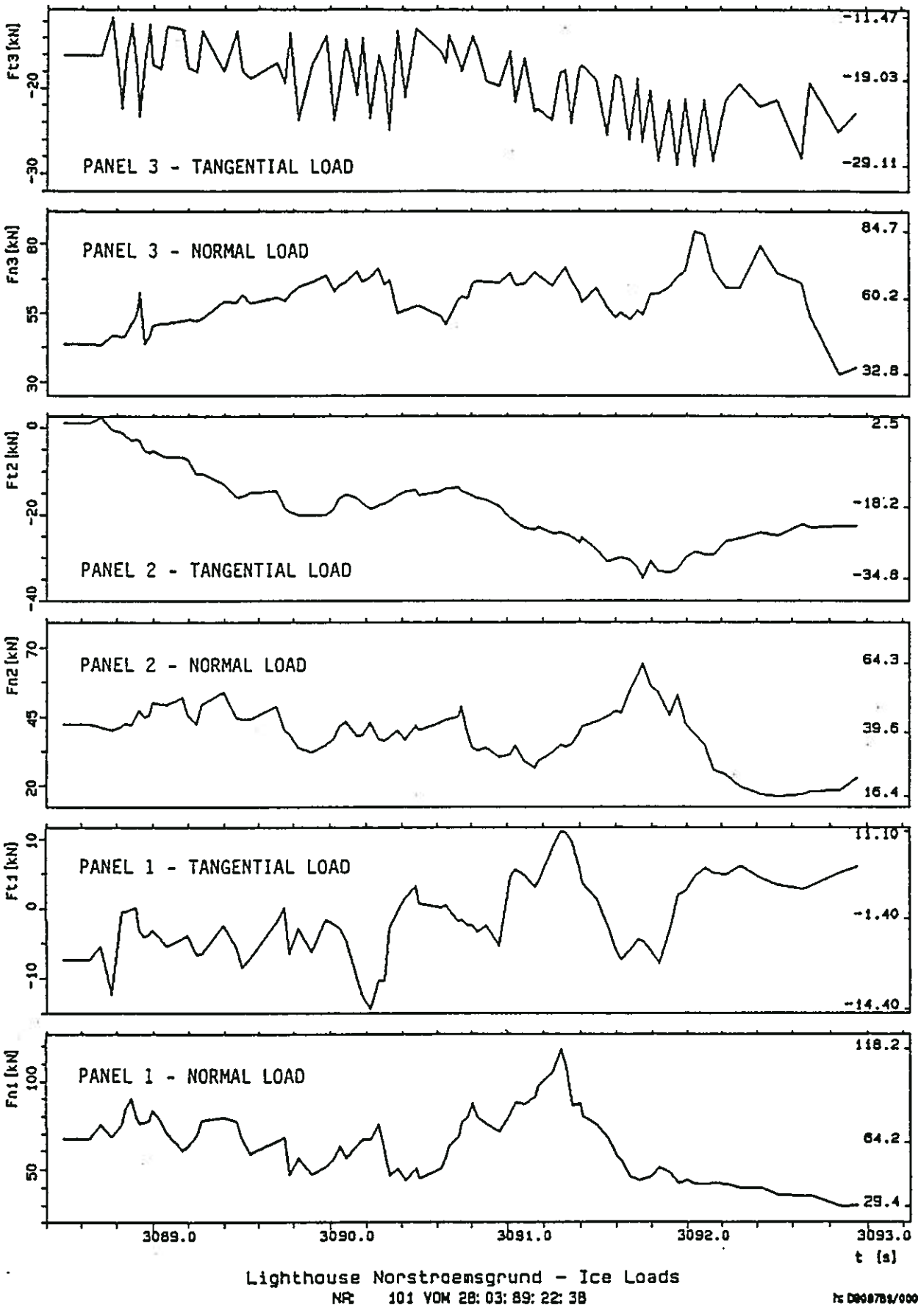

Figure 8:2
Ice force sensing panel records from March 28, 1989.

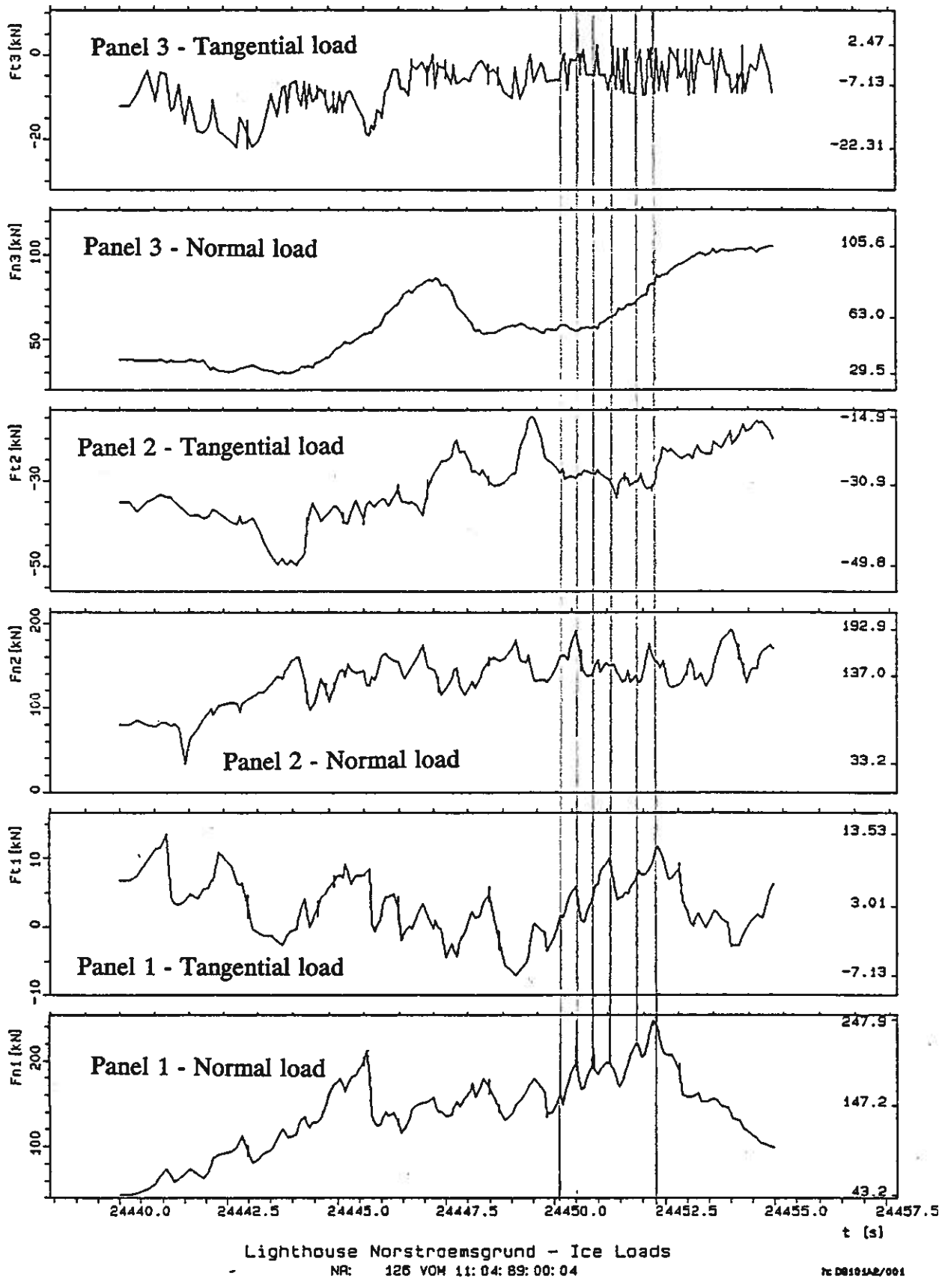

Figure 8:3
Ice force sensing panel records from April 4, 1989 with resonance features during a few seconds