Sette *et al.* Reply: In [1] we report the dynamical structure factor for the liquid and solid phases of water measured by inelastic x-ray scattering (IXS). The data show that (i) in the liquid, the fast sound, already observed in inelastic neutron scattering (INS) [2] and IXS [3], originates from a bend up of the dispersion relation of the acoustic excitations, $\Omega(Q)$; (ii) the bend up takes place when $\Omega(Q)$ become equivalent to the energy of a second weakly dispersing mode; and (iii) from the results in polycrystalline ice, the weakly dispersive mode in the liquid is likely to be reminiscent of the transverse phonon branch in ice Ih.

In their Comment, Martinez *et al.* [4] criticize our analysis of the ice data. The main points of our work, however, i.e., points (i) and (ii), stay by all means undisputable, thanks also to the overwhelming theoretical evidences [5] which are fully consistent with our experiment and interpretation [6].

With respect to the ice data, Martinez *et al.* claim that (1) our analysis would be inconclusive because measurements on a polycrystal induce a severe averaging among excitations in the Brillouin zone, and the steep dispersion relation would be an artifact due to the mixing of different modes. (2) Our ice data, summarized in the dispersion relation of Fig. 4 of [1], would not agree with previous measurements on ice single crystals [7].

Contrary to the first point, we think that one must use the polycrystalline data to compare the high frequency dynamics of the solid with the liquid phase [1,8], exactly because they represent an orientational average within the Brillouin zone.

Contrary to the second point, as shown in Fig. 1, the peak positions from the INS data of Renker on D_2O ice I_h at $T = 88$ K, full symbols [7,9], and our IXS data on H_2O ice Ih polycrystals at $T = 253$ K, open symbols [1,8], are in excellent agreement. The small deviations can be ascribed to the temperature dependence of the force constants.

In Fig. 1, the two lowest transverse (T) and longitudinal (L) branches from the IXS data are reported as a function of the absolute Q value. The T branch is not observed at small Q due to well known polarization selection rules. The INS data, unfolded from the reduced Brillouin zone of the hexagonal lattice with four molecules per unit cells, are reported in the extended zone which also corresponds to the reduced Brillouin zone of a tetrahedral lattice with two molecules per unit cell. The dynamics, in fact, with its force constants and selection rules, is dictated by the almost tetrahedral configuration of the oxygen atoms. This is best exemplified by the negligible dependence on the propagation directions of the phonon energies, and by the absence of energy gaps at the reduced Brillouin zone boundaries of the hexagonal lattice ($7-8$ nm^{-1}). In conclusion, the consistency among the new IXS data and the old INS results confirms our good understanding of the lattice dynamics in ice Ih without need of further theoretical models.
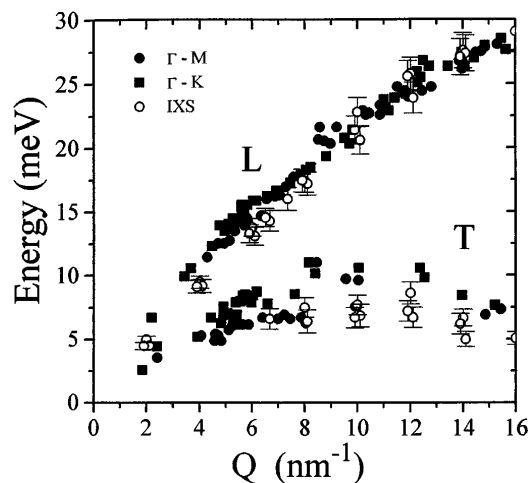

FIG. 1. Dispersion curves for the lowest transverse (T) and longitudinal (L) phonon branches in ice Ih crystals. Full circles (squares) refer to the neutron data taken along the Γ-M(Γ-K) direction in oriented D_2O ice Ih single crystals at 90 K [6]. Open circles refer to the IXS data on H_2O ice Ih polycrystals measured at 253 K [1,7].

In summary, we believe that the present Comment does not add new information to the conclusions reported in [1].

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[1] F. Sette et al., Phys. Rev. Lett. **77**, 83 (1996).
[2] J. Teixeira, M. C. Bellissant-Funel, S. H. Chen, and B. Dorner, Phys. Rev. Lett. **54**, 2681 (1985).
[3] F. Sette *et al.,* Phys. Rev. Lett. **75**, 850 (1995).
[4] J. L. Martinez *et al.,* preceding Comment, Phys. Rev. Lett. **78**, 975 (1997).
[5] A. Rahman and F. H. Stillinger, Phys. Rev. A **10**, 368 (1974); S. Sastry, F. Sciortino, and H. E. Stanley, J. Chem. Phys. **95**, 7775 (1991); F. Sciortino and S. Sastry, J. Chem. Phys. **100**, 3881 (1994); U. Balucani, G. Ruocco, A. Torcini, and R. Vallauri, Phys. Rev. E **47**, 1677 (1993).
[6] Form factor correction are very small in this Q range, and, in any case, they cannot affect a dispersion relation. Multiphonon background corrections do not make sense in a liquid, and what is reported in [1] is the $S(Q, \omega)$ which is, in the present context, the only relevant dynamical variable.
[7] B. Renker, Phys. Lett. **30A**, 493 (1969); *Physics and Chemistry of Ice* (Royal Soc. Canada, Ottawa, 1973).
[8] G. Ruocco *et al.,* Nature (London) **379**, 521 (1996).
[9] P. Bosi, R. Tubino, and G. Zerbi, J. Chem. Phys. **59**, 4578 (1973).