lead to an error of about 3%. In Fig. 5 we show the relative difference between our calculated results and those determined by Van den Meijdenberg *et al.*[16] from fountain-effect work. The agreement is within the combined uncertainties except at 2.0°K, where their results are considerably larger than ours. This may be due to experimental difficulties they encountered near the λ transition. Our results agree well with those of Boghosian and Meyer[14] at 1.3°K, their values being between 1 and 3% above ours. Finally, we find that the entropy results of Wiebes and Kramers[17] give values for the entropy of compression that are 10 to 25% above our results, giving a disagreement that is greater than the combined uncertainties.

We have also calculated changes in the isothermal compressibility along various isobars from

$$\Delta k_T = -\int_{T_0}^{T} \left(\frac{\partial \alpha_P}{\partial P}\right)_T dT, \qquad (4)$$

using graphical integration. Our results are given in Table IV, where $T_0 = 1.3$°K for $T < T_\lambda$ and $T_0 = 2.2$°K for $T > T_\lambda$. The chief value of such data is that the method used in obtaining them is sensitive to small changes along the isobars that otherwise would be calculated as the difference between large numbers. The only systematic direct calculations of k_T throughout this region are those of Grilly.[18] We have obtained k_T at 2.2°K directly from our data and the agreement is within 3% except at 1 atm, where our values are about 5% smaller. This is reasonable agreement, since the spacing of the isobars along which we have taken data is not particularly suited for making such calculations. Grilly's results show some internal inconsistency along the isobars. Our data show the systematic variation of k_T along these isobars.

Finally it should be mentioned that the velocity of sound calculated from the compressibility data at 1.3°K (tabulated in Table V) under the assumption that the isothermal compressibility can be substituted for the isentropic compressibility, is in excellent agreement with the values observed by Atkins and Stasior.[19]

TABLE V. The compressibility k_T at standard pressures (10^{-3} atm^{-1}).

T(°K) \ P(atm)	1	3	5	10	15	20	25
1.30	11.1	10.2	9.0	7.24	5.93	5.18	4.58
2.20	12.3	10.0	7.37	6.63	6.19	5.27	4.38

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[18] E. R. Grilly, Phys. Rev. 149, 97 (1966).
[19] K. R. Atkins and R. A. Stasior, Can. J. Phys. 31, 1156 (1953).

TABLE VI. P_λ, T_λ, and V_λ for liquid He⁴.

P (atm)	T (°K)	V cm³/mole
		Run I
0.493±0.005	2.1685	27.20
2.70±0.05	2.1455	26.48
13.00±0.05	2.0215	24.24
		Run II
0.0497	2.17312	27.3730 (lower triple point)
0.0524	2.17309	27.3725
0.0548	2.17308	27.3710
0.0792	2.17288	27.3618
0.0924	2.17277	27.3557
0.1050	2.17263	27.3516
0.1398	2.17233	27.3373
0.1588	2.17214	27.3294
8.00±0.05	2.0865	25.12
20.10±0.05	1.9225	23.22
27.10±0.05	1.8085	22.45
		Run III
0.494	2.1675	27.22
0.996	2.1635	27.03
5.06±0.01	2.1205	25.81
10.01±0.01	2.0615	24.74
15.01±0.01	1.9955	23.90
17.97±0.01	1.9535	23.47
22.08±0.01	1.8905	22.96
24.93±0.01	1.8455	22.65
28.00±0.01	1.7935	22.32

B. The Temperature Range Close to the Transition

As we have noted, the λ transition is characterized by a discontinuity in the slope of the molar volume-versus-temperature curve (Fig. 2). We have thus determined values of T_λ and V_λ as a function of pressure P_λ and we give these values in Table VI. The carbon thermometers were recalibrated for each of the three runs which were separated by intervals of several months. Since the calibration accuracy was about ±1 mdeg, the different runs are consistent with one another only to this amount. The low-pressure region was investigated with particular care. A number of passes below 0.16 atm were made within a period of 20 h in order to avoid the effects of thermometer drift. The best straight-line fit to these data yields a limiting slope $(dP/dT)_\lambda = -114 \pm 1$ atm/°K and the slight curvature of the points indicates that the true limit may have a somewhat greater value.

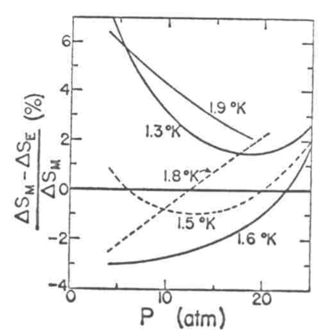

FIG. 5. The relative difference between the entropy of compression results of Van den Meijdenberg *et al.* (Ref. 16) (ΔS_M) and those of this paper (ΔS_E).