St John's College
Cambridge
Dec 13

Dear Fisher,

Sorry, but I don't think your plan a good one. The two absolute determinations refer to particular pillars set up in laboratories, and any reduction to sea level (which can be made in several different ways) would defeat their object. Their purpose is to set up a standard, so that if we want absolute gravity at, say, Seattle, we can swing a pendulum on the bench-pillar & carry it to Seattle & see how much it differs. The fact of Bullard & Browne's correction for height on that Hayl & Cook's pendulum was not at the normal height for ordinary geodetic work, & B & B's was.

But it is a retrograde step to use two stations differing by only 12° in latitude to extrapolate over a range of 180°. It is a usual occurrence for

the mean (over a 10° square with appropriate correction for height) to deviate by ± 22 mgal from the elliptic formula. So at the best we have no right to expect the pole-equator difference inferred from boxlift + T add-lift alone to be right to 150 mgal. The standard error of this difference, using all the available data, is only 4 mgal. That is, I don't think your proposed survey needs anything particular, and may easily be misinterpreted: the method is certainly one that no geodesist would accept for a moment. If you were aiming at the highest accuracy possible at the moment, the best plan is to reduce my final formula by 17 mgal; but if you want a convenient formula to give the best, is the one actually used in practice for comparison at, e.g., 3000 stations in Heiskanen's list, namely the international formula

I am not sure whether you realize the trivial importance of absolute gravity to this accuracy for the

geophysical point of view. Its chief effect would be a correction of 6 parts in $10^6$ to the usual dynamical parallax, which is uncertain to about 1 in $10^4$ anyhow, & it would affect reciprocally the mean density of the earth, about which we have no other source of information. Differences of gravity from place to place are needed to this accuracy before various theories can be properly compared, but the mean value is much less important. Its real use is in standardizing electrical units, which depend ultimately on measuring a force by weighing it, and there an error of $10^{-5}$ does matter. But Kaye & Laby is the place for this rather than a collection of tables mainly for biologists!

Yours sincerely

Harold Jeffreys