



A mu meson has a half-life of 2×10^{-6} s., during which it can travel at most (i.e. at speed = c) about 660m. Still it passes from the top of the earth's atmosphere 5000 m to the earth's surface before it decays, because...

1. In its inertial frame, the 5000m distance is contracted to less than 660 m.
2. In fact it cannot really do so; rather, it is an illusion of the earthbound observer that is described here.
3. It own internal clock slows down and extends its lifetime whenever the earth seems to move past it.
4. None of the above is correct.

inertial frame, t...
 * cannot really...
 * internal clock...
 * the above is ...

The correct answer is #3, because

- in the inertial frame of the mu meson all moving lengths are contracted to a length smaller by $1/\gamma$ than the lengths which would be measured for them in their own rest frames.
- The meson's internal clock however, is a clock at rest in the meson inertial frame, and is therefore unaffected by the earth's motion.
- An observer on earth sees it differently: in his inertial frame, the 5000 high atmosphere is at rest, and the mu meson's clock is moving, and, therefore, ticks γ times slower, giving the meson an extended lifetime to complete its journey.