What if we dug a tunnel through the Earth?

November 30 2015, by Fraser Cain

A composite image of the Western hemisphere of the Earth. Credit: NASA

Long distance air travel sucks. Anyone who's ever had to sit on an airplane for 17 hours, enduring screaming babies, terrible internet, and

the constant threat of deep vein thrombosis knows how bad it sucks. I know, I know, it's the miracle of flight, and I really shouldn't complain. But there's got to be a better way.

Well, I'm happy to inform you, there is a better way. A faster way, where you can travel halfway around the world in less than an hour, with no pesky seats, or even an airplane at all. All you need to do is jump… down. Into that enormous tunnel bored right through the Earth connecting your location with the exact opposite spot on the Earth – your antipode.

Oh, you don't have a tunnel like that nearby? That's probably because it's a terrible idea, completely impractical when you consider the massive engineering challenges to make something like that happen.

But if you could, it would be pretty sweet. Here's how it would work:

The circumference, or distance around the Earth, is approximately 40,075 km, but that depends on where you measure it; around the equator, or from pole to pole. So, to travel overland from one location to its antipode, you'd need to travel 20,037 km.

A tunnel, dug from one side of the Earth to the other would be, on average, 12,742 km. So it's a shorter trip, sure, but that's not the best part.

If you jumped into the tunnel, you'd fall down towards the center of the Earth, accelerating constantly, thanks to gravity. By the time you reached the halfway point, after falling for 21 minutes, you'd be traveling at 28,000 kilometers per hour.

Once you crossed the halfway point, the velocity would carry you back up the other side of the tunnel for another 21 minutes. This time,

however, gravity is slowing you down, so by the time you reach the other end, you come to a perfect stop, just as you arrive at your destination.

In other words, the trip didn't require any energy. You exchanged gravitational potential energy for kinetic energy on the way down, and then exchanged it back on the way up again. No energy was created or destroyed. We obey all the laws of thermodynamics here on the Guide to Space.

The trick is that you need to make sure the tunnel is a complete vacuum, so that you don't experience any air resistance during your journey. That would cause you to fall at terminal velocity, and you'd end up stuck at the center of the Earth, completely weightless and helpless.

I'm sure the engineer in you is screaming obscenities at the screen right now. We can barely dig a tunnel just a few kilometers into the reasonable outer crust of the Earth. Forget digging down through the hotter part of the crust, into the mantle, where rock squishes and oozes around like jello. And you can completely forget digging through the Earth's metal inner core, which probably spins faster than the Earth itself.

Now, this is practically impossible on every level. However, this idea isn't completely terrible. Here's the cool part.

If you dig a tunnel between any two points on Earth, you can still take advantage of the Earth's gravity. Instead of traveling between two antipodes, you could travel a much shorter distance, without piercing so far down.

This concept is called a Gravity Train. For example, you could build a shallow tunnel from London to Paris, that only goes down about 55 kilometers. Evacuate the tunnel, and the gravity train is pulled down for

half the journey, and then decelerates naturally for the second half. And amazingly, the journey still only takes 42 minutes. No matter which two points you connect, the journey will only take 42 minutes.

Practically speaking, though, even a tunnel like that, which would dip into the Earth's mantle a little bit, is way beyond the engineering reach of anything we can imagine. But who knows what amazing technologies we'll figure out in the future? Maybe some day you'll be able to travel around the Earth, using up no energy, going anywhere you like in 42 minute train rides.

What two spots on Earth should be connected by a gravity train? Would you ride in one? Let us know your thoughts in the comments below.

In our next episode, we'll let you know what it takes to become a NASA astronaut; including the "right stuff", whatever that is. Make sure you subscribe to our channel, so you'll get notified the moment we publish it.

Oh, and make sure you stick around for the blooper.

Speaking of bloopers, our Patreon community sees entire blooper reels, gets advanced access to all our videos, and sees no ads on Universe Today.

Join the club of 511 amazing people who support us in making great space and astronomy content. The people who make these shows even possible, like Tony Barry and David Whitlow. Want to get in on the action? Click here.

Source: Universe Today

2024 from https://phys.org/news/2015-11-dug-tunnel-earth.html