STUDY NOTES · BASIC CONCEPT

If the Earth rotates at about 1,670 km/h (1,040 mph) at the equator, why don’t we feel this motion at all?

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Earth rotates at about 1,670 km/h (1,040 mph) at the equator — yet we don’t feel this motion at all.

Here are the main scientific reasons why:

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1. Constant speed (no acceleration)

We only feel motion when there is acceleration or change in speed/direction (think of feeling pushed back when a car accelerates, or sideways when it turns sharply). Earth’s rotation is extremely steady and constant — it completes one full turn every 24 hours without any noticeable speeding up or slowing down in our daily lives. → No acceleration = no sensation of motion.

2. We are moving together with the ground, air, and everything around us

You, the ground beneath your feet, the air you breathe, the building you’re in, the water in a glass — everything is rotating at exactly the same speed as Earth. Because there is no relative motion between you and your surroundings, there is nothing to create the feeling of being “spun.” (Compare: If you’re inside a smoothly flying airplane at 900 km/h, you don’t feel the speed either — because you and the plane are moving together.)

3. The rotation is very slow compared to the size of Earth

- Earth’s circumference at the equator ≈ 40,075 km

- One rotation = 24 hours
- Angular speed ≈ 15° per hour (very gradual)

The turn is so gentle that the centrifugal force produced is tiny compared to gravity.

4. Gravity is much stronger than the centrifugal effect

The centrifugal force (outward push due to rotation) at the equator is only about 0.3% of gravity. → Gravity easily overpowers it, so we are pressed firmly downward and don't feel flung outward.

Quick Comparison Table

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Aspect	Car accelerating from 0 to 100 km/h	Earth's rotation at equator
Speed change	Rapid (acceleration)	Zero (constant speed)
Relative motion to surroundings	You feel pushed back	None — everything moves together
Force felt	Strong (inertia)	Negligible (~0.3% of gravity)
Sensation	Yes	No