

Re: Fair orbital question

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- *From:* bz <bz+sp@xxxxxxxxxxxxxxxxxxxxxx>
 - *Date:* Tue, 10 Jun 2008 18:08:28 +0000 (UTC)
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"Spaceman" <spaceman@xxxxxxxxxxxxxxxxxxxxxx> wrote in news:9t6dnVTzOq78PdPVnZ2dnUVZ_orinZ2d@xxxxxxxxxxx:

"bz" <bz+sp@xxxxxxxxxxxxxxxxxxxxxx> wrote in message <news:Xns9AB95C3E0531CWQAHBGMXSZHVspammote@xxxxxxxxxxxxxxxxxxx>

A friend of mine grew up on the equator in South America
She was quite shocked by the seasons when she moved to the US.
She said that on a rainy day in Colombia they said 'it is winter today'.
On a sunny day 'it is summer today'. They have no seasons because their
days do not vary very much in length.

Without the tilt of the earths axis there would be almost no 'seasonal
variation' because the earths orbital eccentricity is very small.

The point of closest approach to the sun is mid winter for the norther
hemisphere. That would be our summer if there was no tilt.

bz,
We know the tilt is the basic cause for
the shift in seasons from north to south,

When you want to decide which factor is 'most important' you need to look at
what would happen if that factor went away.

The sun is clearly the most important factor in the seasons. Take it away and
the earth freezes.

Next most important is the rotation of the earth because half the earth is
always in the shadow. That fact should be as clear as night and day to you.
The rotation effects things on a 24 hour basis because that is how fast the
earth rotates.

Next most important noticeable fact is that certain parts of the earth are in
darkness for many days at a time while other parts are in sunlight for many

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days. And those parts 'swap' once a year.

We have two things that happen 'once a year'

- 1) the earth makes an orbit around the sun.
- 2) because the earth's axis is tilted, the portion that is most exposed to the sun shifts from one end of the earth to the other.

The way to see which is more important would be to stop one or the other. We can't really do either but lets imagine for one moment that we could get rid of the tilt. Then summer in the north in June and summer in the south in December would go away [almost completely]. I think simple calculations would show you less than a degree in temperature change throughout the year. You can 'verify' that prediction by looking at the seasonal temperature variation throughout the year at various locations ON the equator.

Now, lets imagine that we could stop the earth from orbiting around the sun, hold it in one location on the earth's orbital path AND make the axis of rotation tilt from +24 degrees to -24 degrees and back to +24 degrees over the period of a year. [Yeah, it can't be done but imagine it could]. What would we see? We would see seasons very similar to what we do see.

This demonstrates to me that the tilt is more important than the revolving around the sun.

but it is not the cause of the seasonal changes themselves.
such as why it will be colder and why it would be hotter
for anywhere at all.

The orbit alone is a cause but of course would not
be so much a change as now.

but the tilt is not the cause itself, it is only a secondary cause
of the swapping of seasons only.

Be careful, you put the "-- " and your signature here. That kept Xnews from picking up the rest of the article. I had to pick it up manually. A proper news reader interprets the "-- " as the beginning of the signature and does NOT pick that up in a response. [sigs should not normally be quoted unless one is commenting upon the sig's contents.]

Look at that video again. It starts with the north pole in darkness, 24 hours a day. That tends to make things cold.

Again, you are not thinking about the actual cause for
the changes at all.

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I am. I just went through it all. Hopefully you actually followed the thought experiment.

(not the shifting of north to south seasonal stuff)
The shifting of the seasons "at all" being one 360 degree motion.
without the tilt and just the elliptical path we know for Earth.

If the variation in lighting isn't the cause of the seasons, what is?

that is just it.
That variation in light occurs without the tilt,

No! Without the tilt, the sun would NEVER be directly overhead at 23 degrees north latitude, the sun would always be at -23 degrees from the vertical at noon at that latitude. The sun would always be at -90 degrees, when viewed from the north or south pole.

The seasons are actually caused by orbit alone.

No. If the orbit caused the seasons then there would be seasons on the equator.

and the tilt is the cause of shifting them

The shifting is what makes what we think of as seasons.

and making them
higher variations in hotter or colder
The variations would be there without the tilt.

VERY small variation.

[quote http://science.nasa.gov/headlines/y2001/ast03jul_1.htm]
July 3, 2001 On the 4th of July Earth will be at its greatest distance from the Sun this year. But don't expect any sudden relief from the heat, say scientists. Northern summer will continue unabated --perhaps even worse than usual-- despite our arrival at a distant part of Earth's orbit called "aphelion."

"Like all planets in our solar system, Earth travels around the Sun in an

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elliptical orbit," explains astronomy professor George Lebo, a Summer Faculty Fellow at the NASA Marshall Space Flight Center. "We make our closest approach to the Sun (147.5 million km) in January, that's called perihelion, and we're farthest from the Sun (152.6 million km) in July, that's aphelion. This year, aphelion falls on Independence Day in the USA."
[unquote]

Look at the figure from that year. 147.5 mkm vs 152.6 mkm, less than 2% difference. This makes for a 7% change in insolation because the energy changes with the square of the distance. By my calculations, this could account for a 38 F degree difference between average summer high and average winter high temperatures at the equator [ASSUMING no moderating effects due to air circulation etc!].

That would make an average winter high of 62 degrees for an average summer high of 100 degrees. Actually, of course there are many things that would reduce that gap.

they would just be evened out among the planet better instead.

Much better. So much better that we would not notice much difference between summer and winter.

<http://en.wikipedia.org/wiki/Solstice>

[quote]

The seasons are not caused by the varying distance of Earth to the Sun due to the orbital eccentricity of the Earth's orbit. This variation does make such a contribution, but is small compared to the effects of exposure because of Earth's tilt. Currently the Earth reaches perihelion at the beginning of January, which is during the northern winter and the southern summer. The Sun, being closer to Earth and therefore hotter, does not cause the whole planet to enter summer. Although it is true that the northern winter is somewhat warmer than the southern winter, the placement of the continents, ice-covered Antarctica in particular, may also play an important factor. In the same way, during aphelion at the beginning of July, the Sun is farther away, but that still leaves the northern summer and southern winter as they are with only minor effects.

[unquote]

think about it anyway.

I have. Thinking is fun. Get out your calculator and do some figuring is even more fun.

:)

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If the variation in lighting isn't the direct result of the tilt of the earth's axis, what is?

Just the orbit alone, (distance changes and time changes of heating and cooling time.)

Sorry, it is not enough to account for the span between winter high temps and summer high temps. Try it yourself. Use the average summer high temperatures in kelvin and decrease it by 7%. Very rough model but gives a 'worst case' idea of the maximum effect the eccentricity could have, alone.

Try it if you can on a 3D program if you can.

Try it with google sketch up if you want 3D pictures but a mathematical model should be enough.

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bz

please pardon my infinite ignorance, the set-of-things-I-do-not-know is an infinite set.

bz+sp@xxxxxxxxxxxxxxxxxxxxx remove ch100-5 to avoid spam trap

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