

## Activity 7 – Climate Zones and Climate Change



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How do the Earth's climate zones develop and what impact does climate change have on their expansion?

### Part 1: How do climate zones develop?

Mit diesem Versuch erlebt ihr modellhaft, welcher Zusammenhang zwischen dem Einfallswinkel der Sonne und den Klimazonen besteht und wie sich der Klimawandel darauf auswirkt.

→ Now change the inclination angle of the solar cell and make a qualitative note of the rotation speed for the following angle positions:

Rotation speed at 90°:                      45°:                      0°:

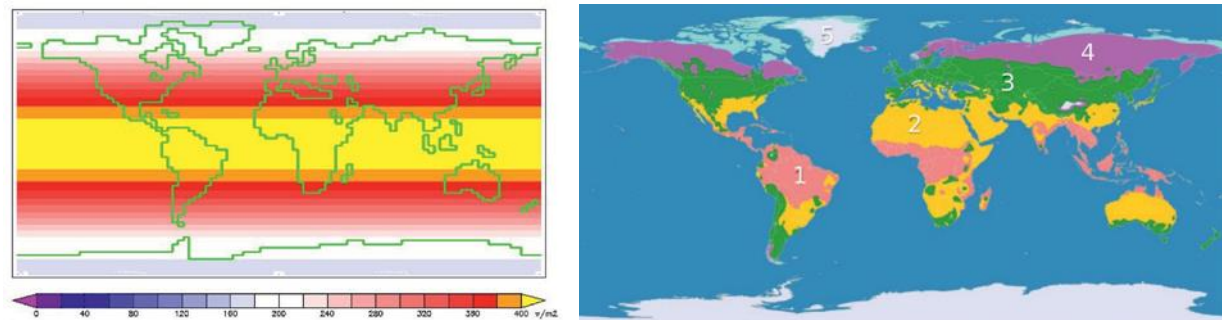
0°: fast	(U = 3,66V	I = 25mA	→	P = 91,50W)
45°: slow	(U = 1,65V	I = 15mA	→	P = 24,75W)
90°: still	(U = 0V	I = 1mA	→	P = 0W)

→ Summarise the test result in one sentence.

The speed of the propeller - and thus the intensity of the radiation on the solar cell - decreases with increasing angle of incidence! (strongest effect at perpendicular incidence)
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### Evaluation:

The left figure shows the annual mean value of solar radiation at the top of the atmosphere in the unit  $\text{W/m}^2$ . The right figure shows the division of the Earth into our five main climate zones.



On the left: Annual average solar radiation on top of atmosphere; Right: Genetic climate classification  
(Source: left: Wiliam M. Conolley); Right: <https://upload.wikimedia.org/wikipedia/commons/thumb/9/9c/Klimag%C3%BCrtel-der-erde.svg/2880px-Klimag%C3%BCrtel-der-erde.svg.png>)

→ Assign the following climate zones to the numbers 1 to 5 and give approximate values of average solar radiation for each zone: Subpolar zone, subtropical zone, temperate zone, polar zone, tropical zone

Number	Climate zone	Average solar radiation in $\text{W/m}^2$
1)	<i>Tropical zone</i>	<i>&gt;400</i>
2)	<i>Subtropical zone</i>	<i>390</i>
3)	<i>temperate zone</i>	<i>300</i>
4)	<i>Subpolar zone</i>	<i>240</i>
5)	<i>Polar zone</i>	<i>200</i>

→ Explain briefly the connection between the left and the right figure above.

*The climate zones are formed because the curvature of the earth creates different angles of incidence for the sun's rays in different zones of the earth, depending on latitude. As with the solar cell and the propeller, the intensity of radiation is directly related to the angle of incidence. Thus, the closer an area is to the equator, the higher the incident radiation intensity, reaching its maximum at the equator itself, with perpendicular incidence at times.*

*The radiation intensity on an area is in turn directly related to the temperature there and thus also to the climate of the respective areas.*