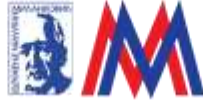


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О КЛИМАТСКИМ
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100 YEARS of
MILANKOVIC'S THEORY of
CLIMATE CHANGE



INTRODUCTION TO COSMIC ENERGIES AND FORCES CONVERSIONS

Author: MSc Predrag Spasojević



1. INTRODUCTION:

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- Our world is changing fast, for the worst.
- We are witnessing problems with climate, pollution, shortage of basic resources, overpopulation, new diseases.
- To find solutions, we have to understand the world we live in and reasons that caused it.
- Science, only motivated by the wish to establish facts and offer the best possible long-term technical, sustainable and economical solutions should lead this transformation of our way of thinking and living. But, apart of changing a perception to life, we will need vast amount of energy to reverse the wrong doing.
- Energy sector is already in transformation towards the renewable energies.

2. DEFINING ENERGY AND THE MATTER INTERACTION

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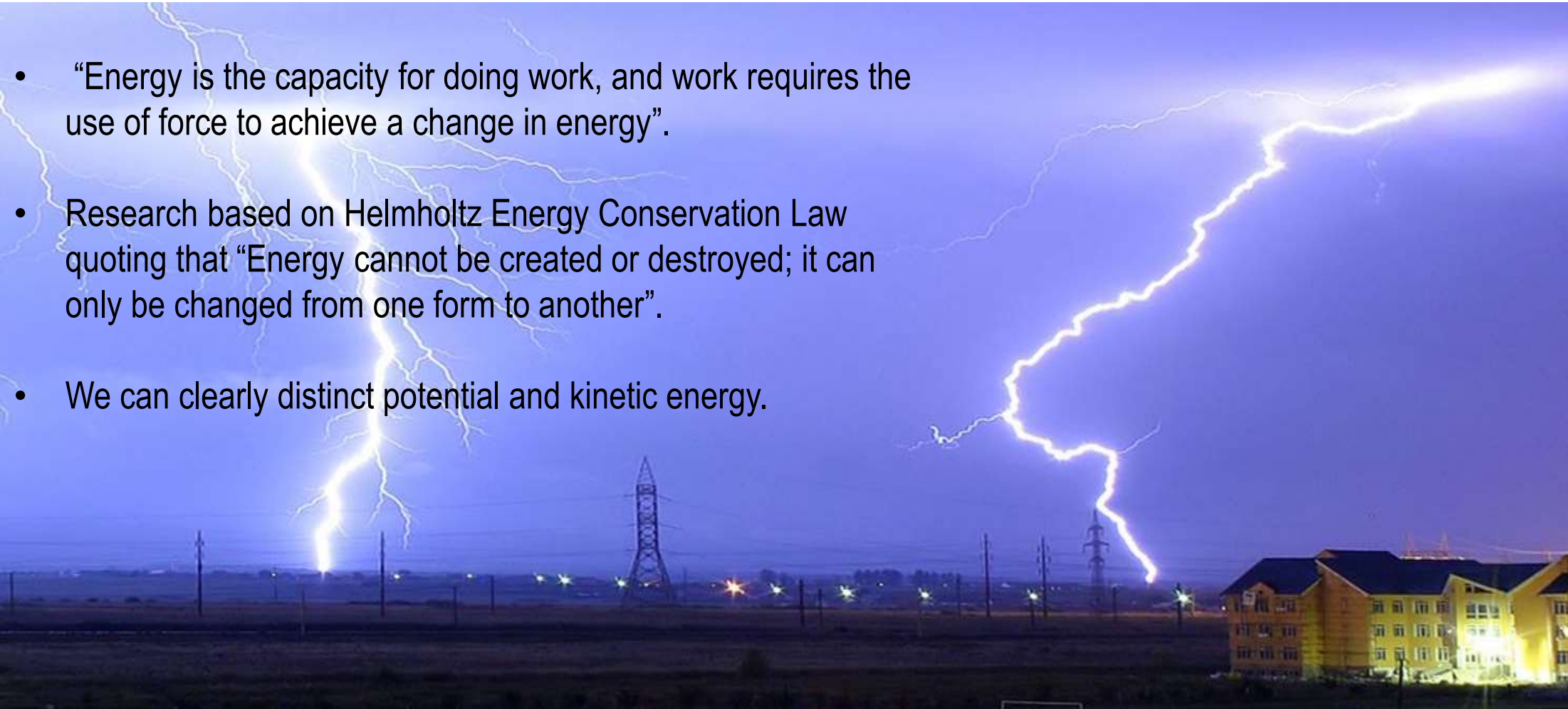


- From simple observation of our surroundings, we see objects, colors, movement.
- Understanding relationship between energy and the matter is beginning and the end of all sciences, key for all the answers.



<https://beyond100percent.files.wordpress.com/2013/04/9638844-a-dandelion-blowing-seeds-in-the-wind.jpg>

ENERGY:



- “Energy is the capacity for doing work, and work requires the use of force to achieve a change in energy”.
- Research based on Helmholtz Energy Conservation Law quoting that “Energy cannot be created or destroyed; it can only be changed from one form to another”.
- We can clearly distinct potential and kinetic energy.

FORCES:

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- Quantum mechanics recognizes gravitational, electromagnetic, weak and strong nuclear forces, transferred by the waves, which interact with chemical masses of Earth, creating our world the way it is and us in it.

THE MATTER:



- The matter is a word describing any type of substance with mass and size.
- It is represented with 118 chemical elements known to us, related to each other in different forms of molecules, existing in solid, liquid, or gaseous form, producing an almost endless number of combinations, possibilities and responses.



ENERGY CONVERSIONS:

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<https://cdn.guidingtech.com/media/assets/WordPress-Import/2016/09/solar-panel-energy.png>

- The term fuel, represent any concentration of energy that can be converted into some other shape – with or without our assistance.



https://img.haikudeck.com/mg/1mdqnic5wf_1426423295542.jpg



<http://media-1.web.britannica.com/eb-media/41/91641-050-0088637E.jpg>

- Electricity is generated from:
 - ❖ Fossil fuels
 - ❖ Nuclear fuels
 - ❖ Renewable fuels

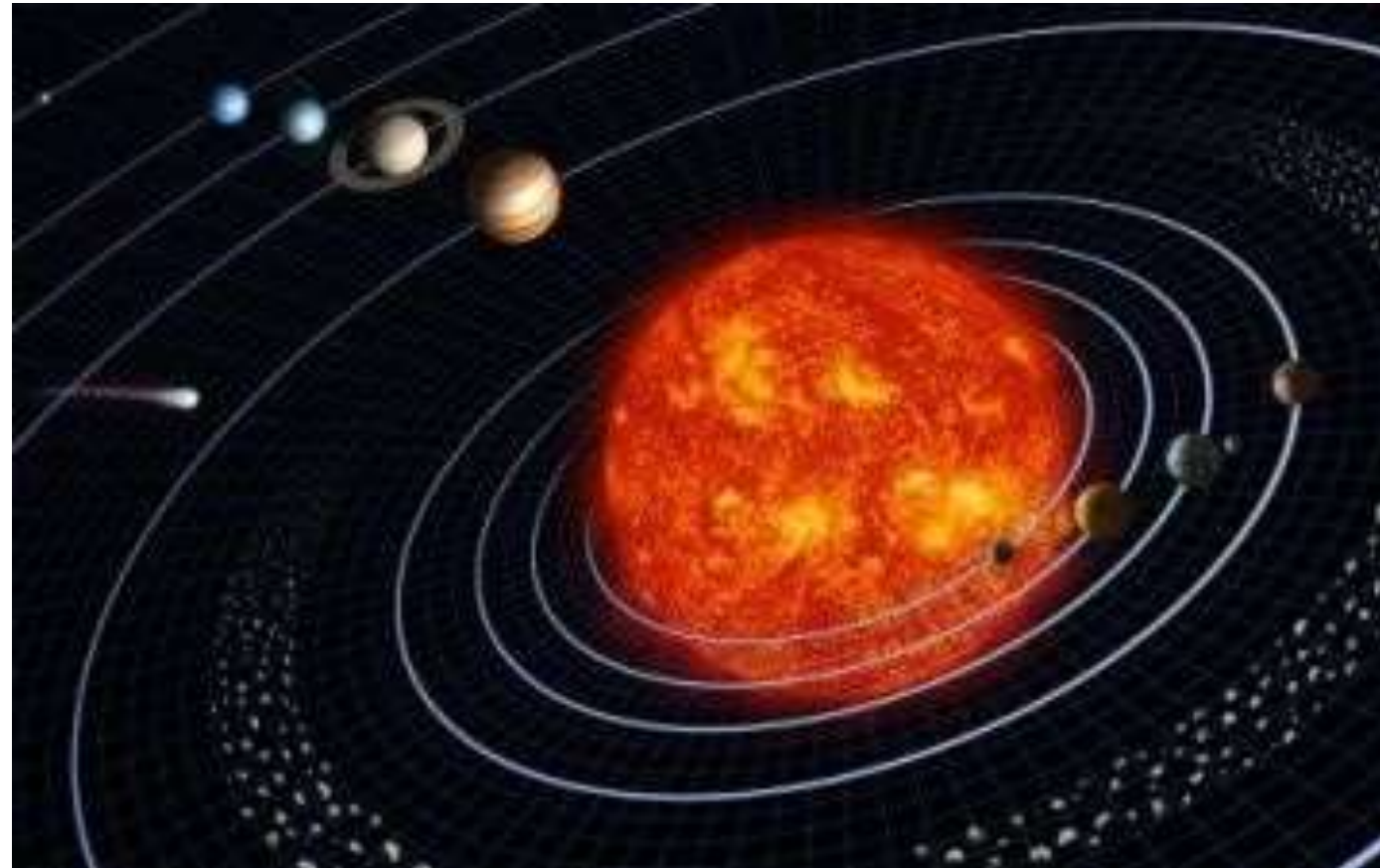
- Energy is converted in interaction with the matter.
- During each energy conversion, a part of the energy is transformed into a less useful and dispersed form of thermal energy.

3. RESEARCH ON ENERGY SOURCES:



GRAVITY:

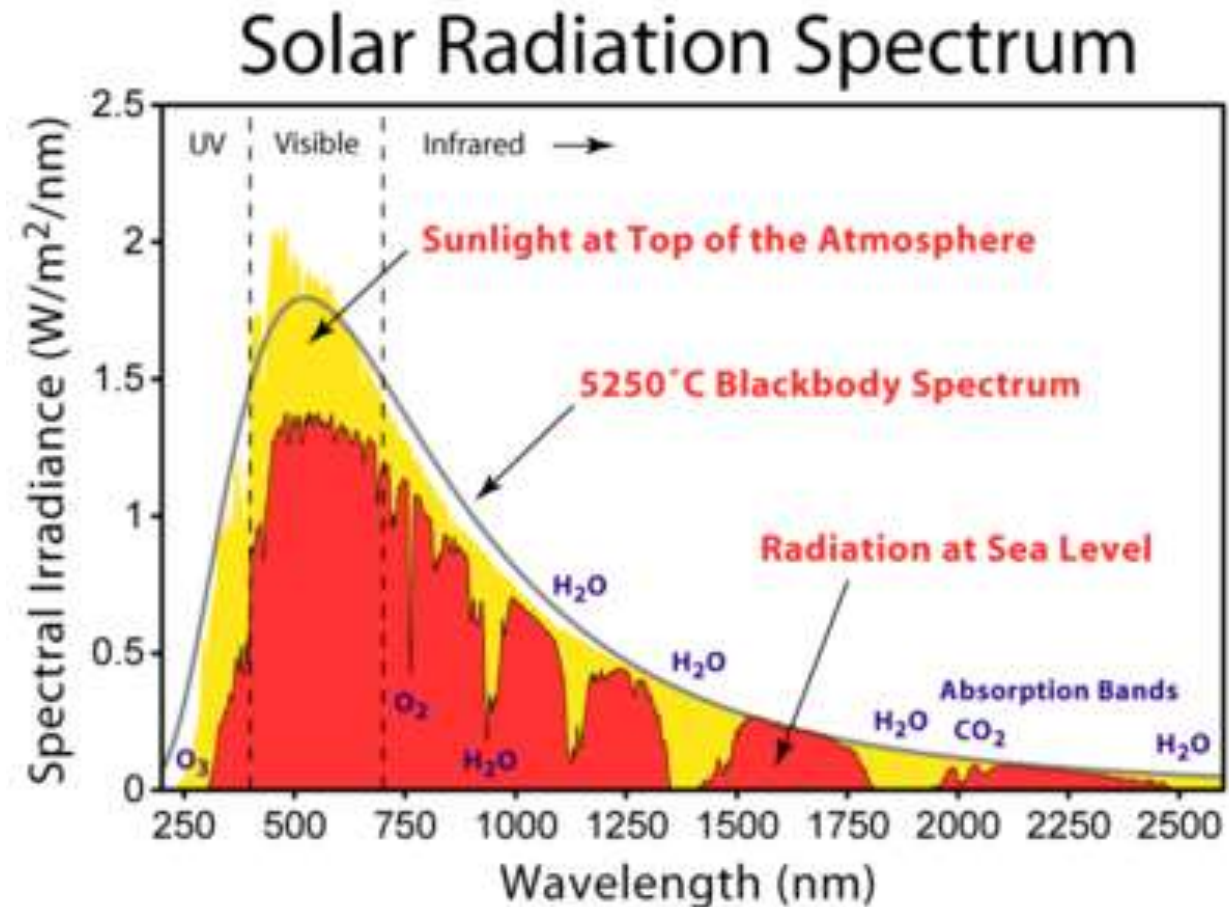
- Characterized by the mass and the energy transferred over the large distance, always attractive, carried by the particle called graviton.
- Changes in Earth's gravity caused by the Moon and other space objects changing its liquids density, causing mass redistribution and, with the other factors, influences deviations in rotation (precession, obliquity and eccentricity) and insolation, causing climate variations.
- Gravity has two components:
 - ❖ It draws/interacts with other space objects, and
 - ❖ Each space object attracts and holds its contents together, generating weight.



Electromagnetic energy:



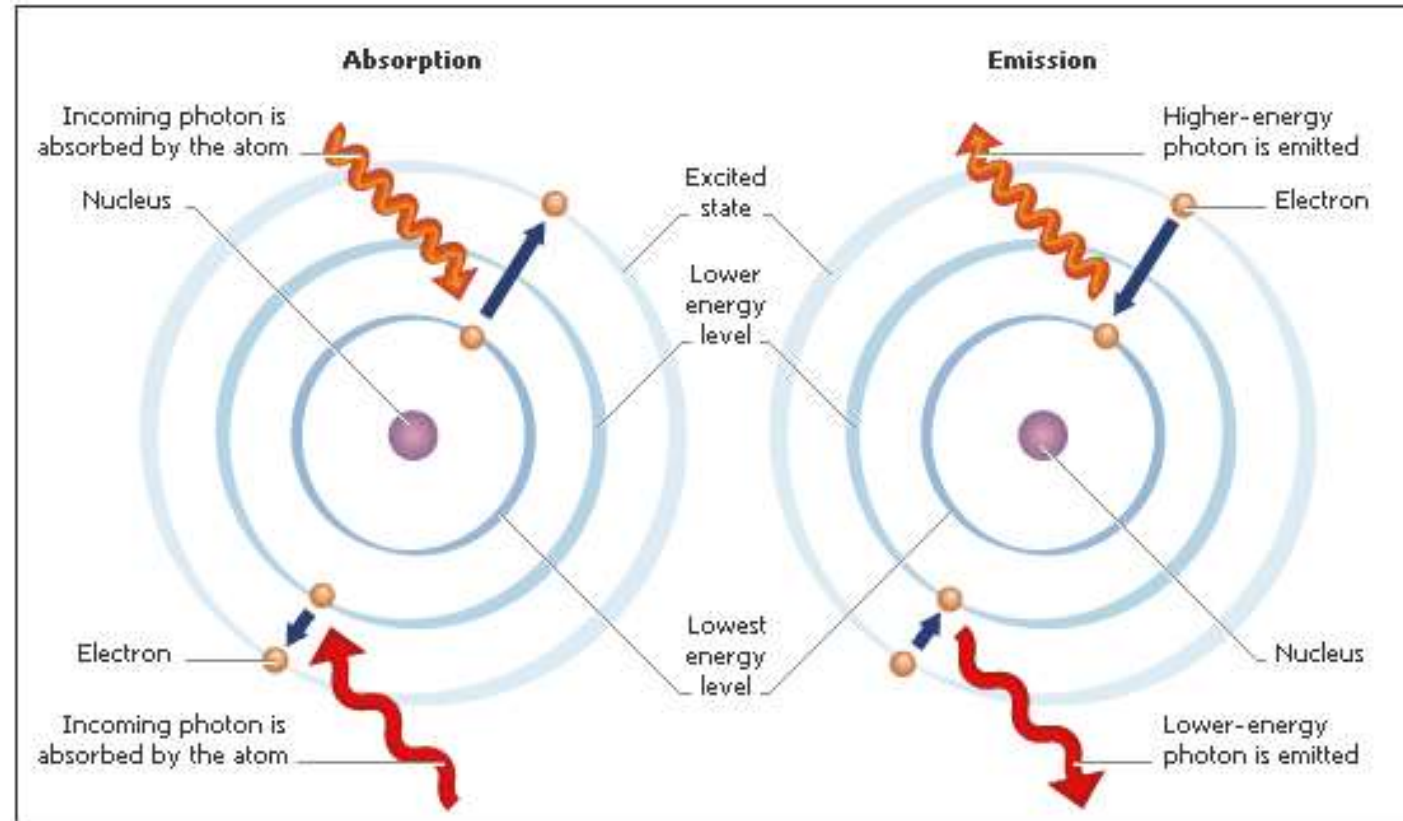
- The Sun's gravitation creates pressure that turns hydrogen to helium, converting a mass portion into electromagnetic radiation.
- All bodies on temperature above absolute zero emit photons which differs by the quantity of energy it is carrying. It is attractive for different, and repulsive for the same electrically charged particles.
- The Sun is emitting from gamma to radio waves.



Matter-photon interaction:



- Everything is composed of atoms that differ by the quantity and structural arrangement of fundamental subatomic particles (protons, neutrons and electrons).
- In terms of energy, stable atoms can be in ground state or excited.
- Radiative transitions between atomic energy levels produce spectra characteristic of the atoms and molecules (the appearance of bands).
- ❖ Infrared cause electron vibrations and heat emission,
- ❖ Visible and near-ultraviolet brings the energy that stimulates chemical reactions (molecule creations) by interacting with outer (valence) electrons, and
- ❖ Larger photons – Gamma, X, and the rest of Ultra Violet - are breaking the molecular bonds and destroying biological and other molecules.

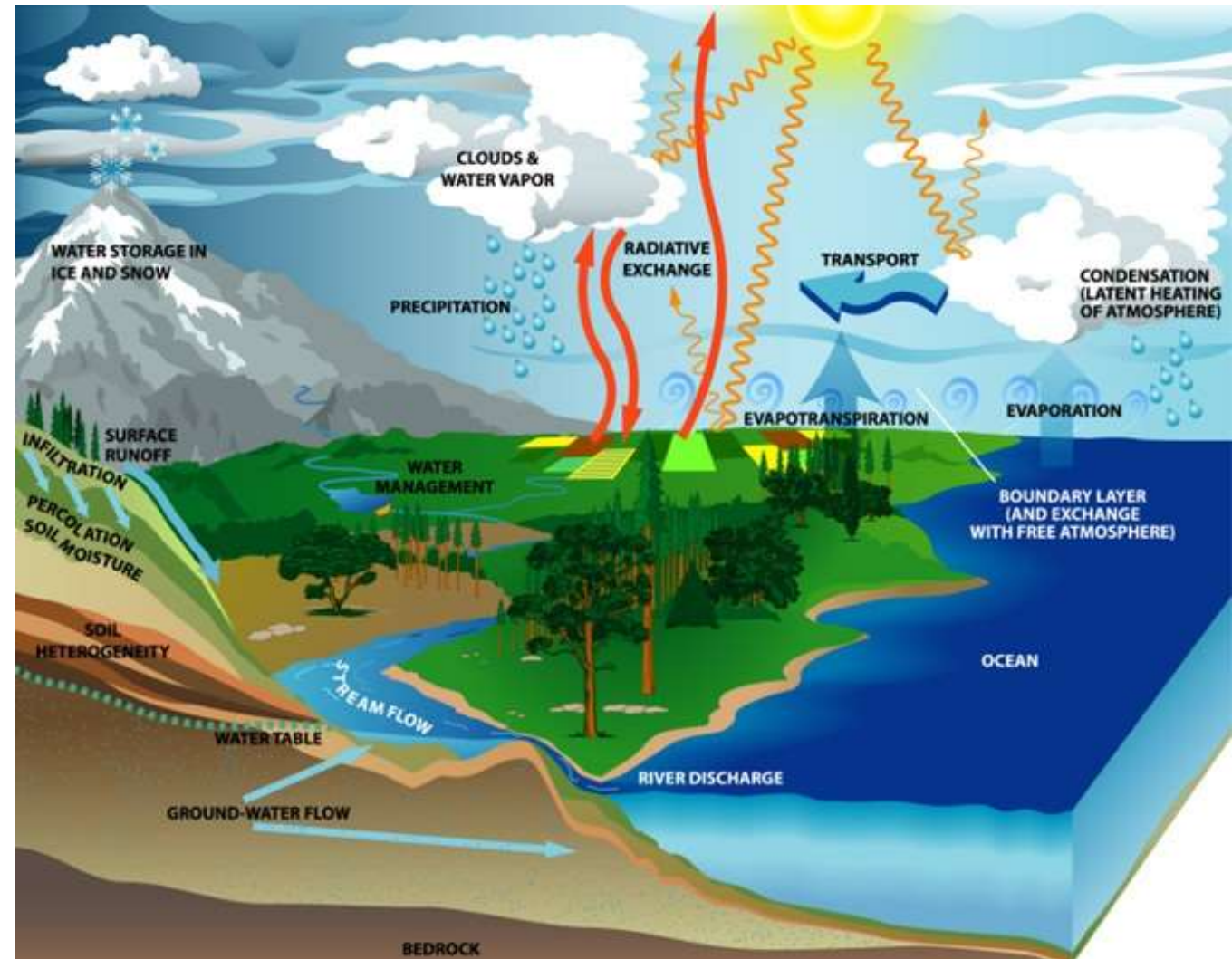


<http://light.physics.auth.gr/images/enc/photon.gif>

The matter mediums on Earth:



- The atmosphere is gaseous medium, reflecting, absorbing and transmitting electromagnetic radiation.
- Earth surface: Radiation that reaches Earth surface consists of about 6% of UV, 50% is visible and 40% is infrared radiation.
- Water: Gravity and temperature variations create and control the hydrologic cycle, changing aggregate states of water and providing us with all aspects of water-related energies.



4. CREATING A SIMULATION MODEL:

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- Any deeper analysis would require simulation which includes energy transfer from the Sun to Earth surface.
- A model that Milutin Milanković presented in a book called “Canon of insolation and the Ice Age problem” have a good similarity with the requirements, so it will be investigated for energy analysis application.

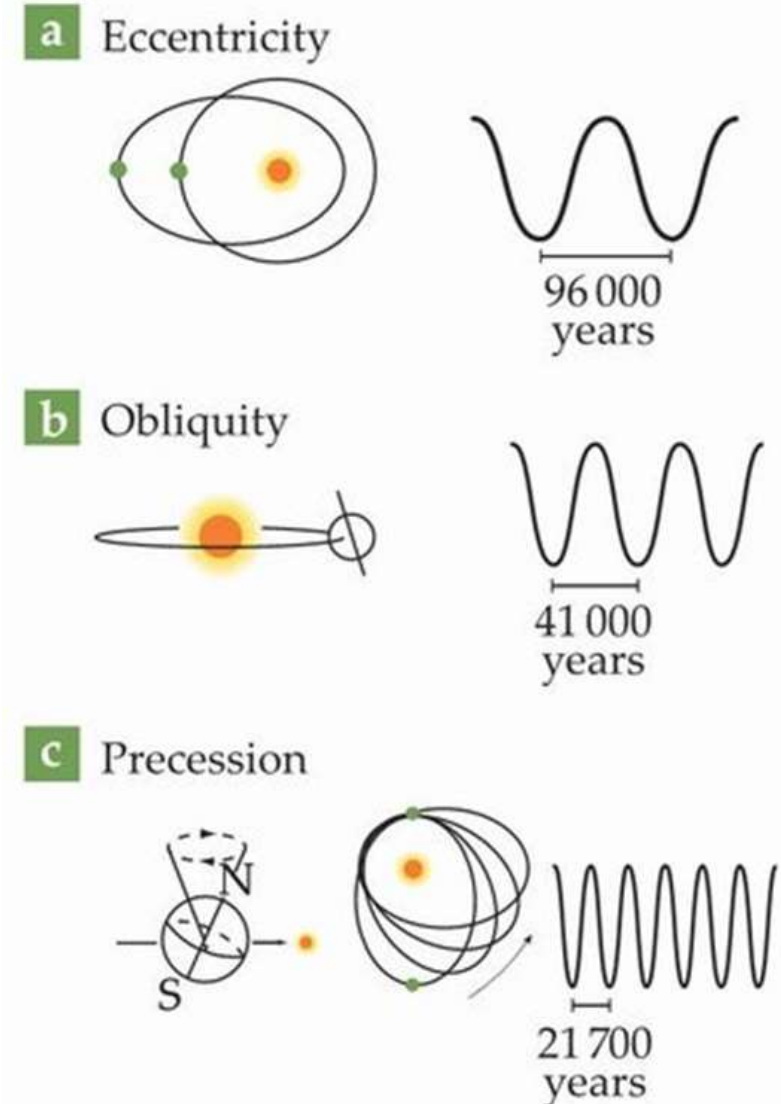


Milanković's model is consisting from the following sections:



Forces:

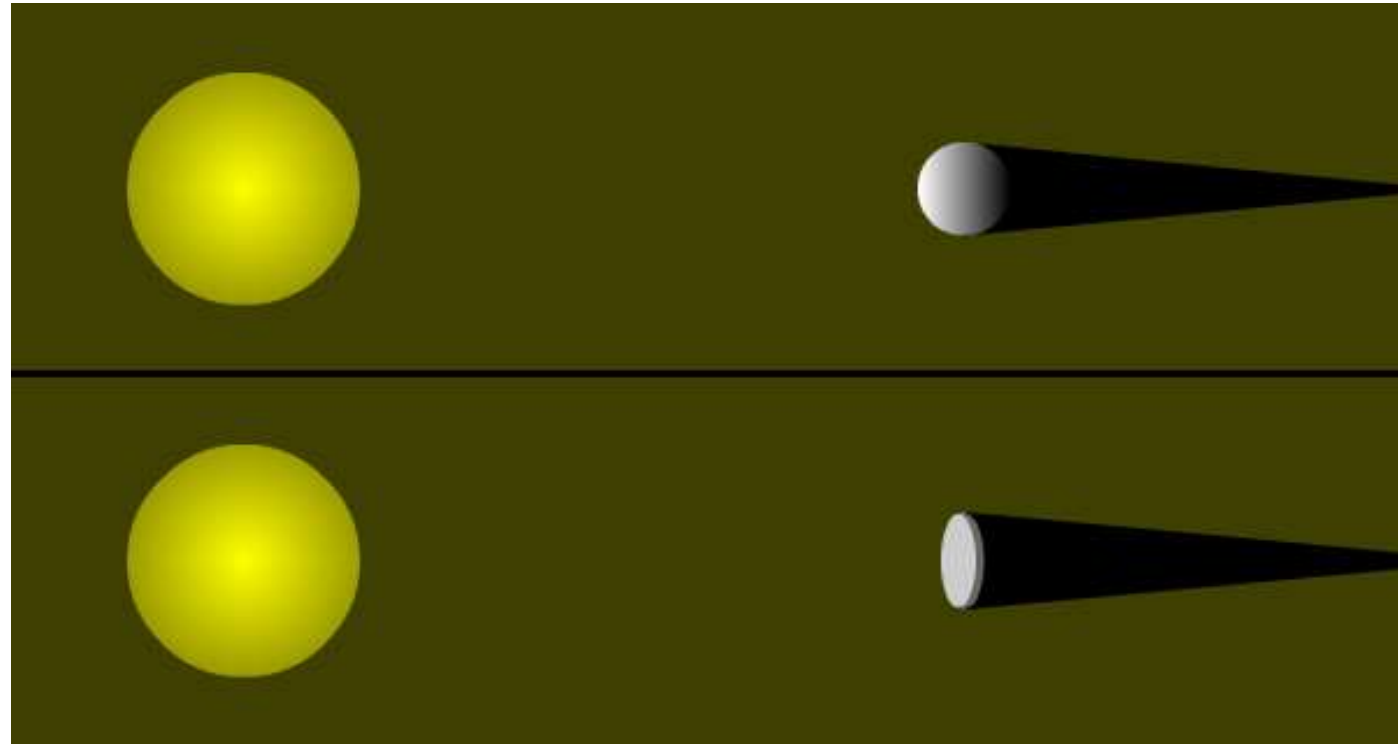
- Defining all space objects within the Solar system and their mutual interaction by applying Newton laws.
- Model includes complex relationships with the moons, each other, rotation properties individually and around the central point – the Sun.
- A detailed analysis of Earth trajectory revealed cyclic variations called precession, obliquity, and eccentricity that are pointed to be the main reasons for variations of Sun's energy received.





Electromagnetic radiation:

- Sun evenly spreads radiation in all directions in dominant wavelengths calculated from its temperature.
- Each object receives a portion of energy as a “flattened” image, positioned on the mean distance from the Sun (The planet’s energy balance depends on the Solar constant).
- This energy is spread over a curved surface following rules of celestial mechanics, changing beam angle due to the planet rotation in time.



The matter and its interaction with the energy:

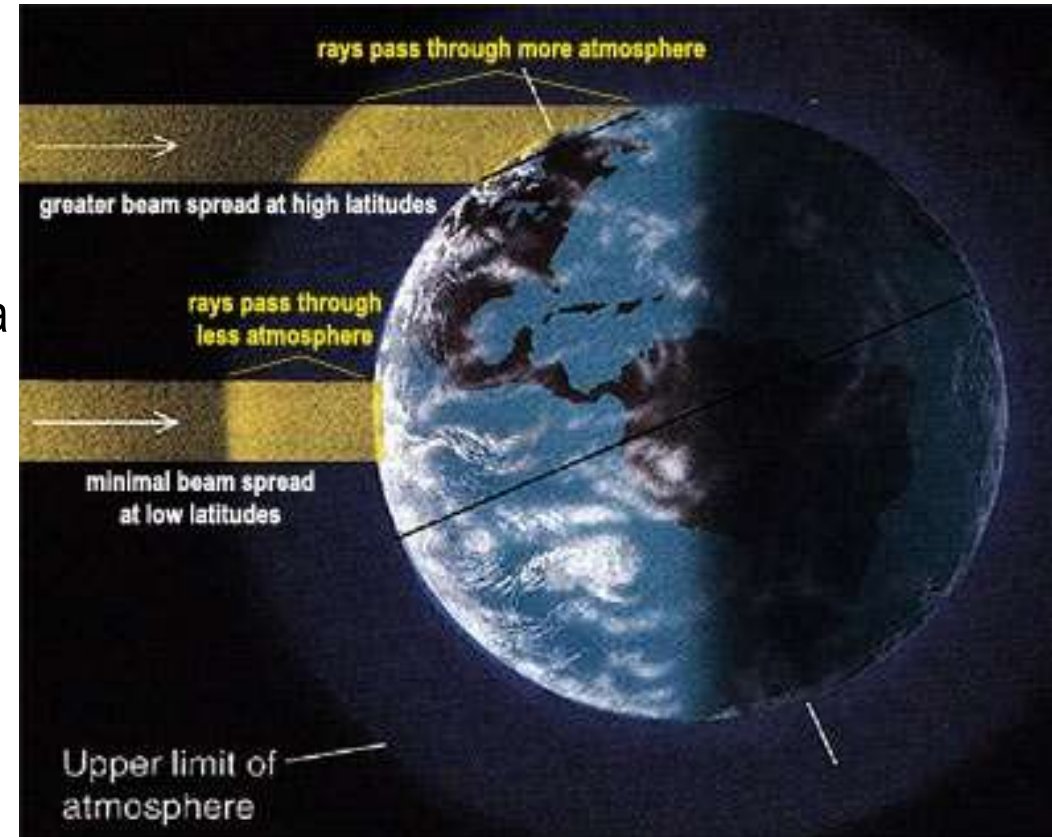
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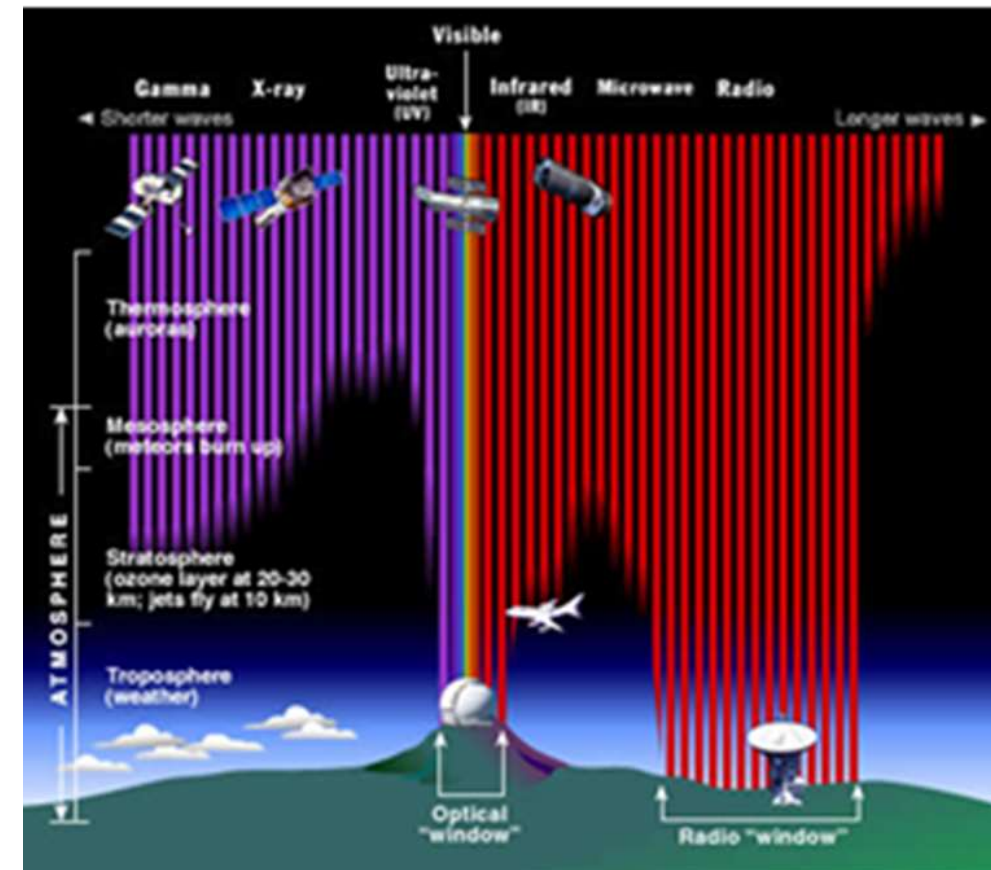
- Molecules and atoms of the atmosphere are interacting with photons by reflecting them or absorbing and re-emitting it, both in all directions, limiting end product radiation on infrared, visible, and near-ultraviolet spectrum.
- As per Stefan-Boltzmann law, Earth will radiate the infrared spectrum, indicating that energy exchange should be looked at from a heat perspective and available energy through the heat budget.
- For understanding energy exchange within the atmosphere, Milutin Milanković used Climatology and Meteorology.
- To produce acceptable radiation balance values, Milankovic applied, as a constant value:
 - ❖ The Sun's energy influx (Solar constant),
 - ❖ the shape of Earth,
 - ❖ characteristics of the atmosphere, and it's content.



5. MODEL APPLICATION TO ENERGY DOMAIN

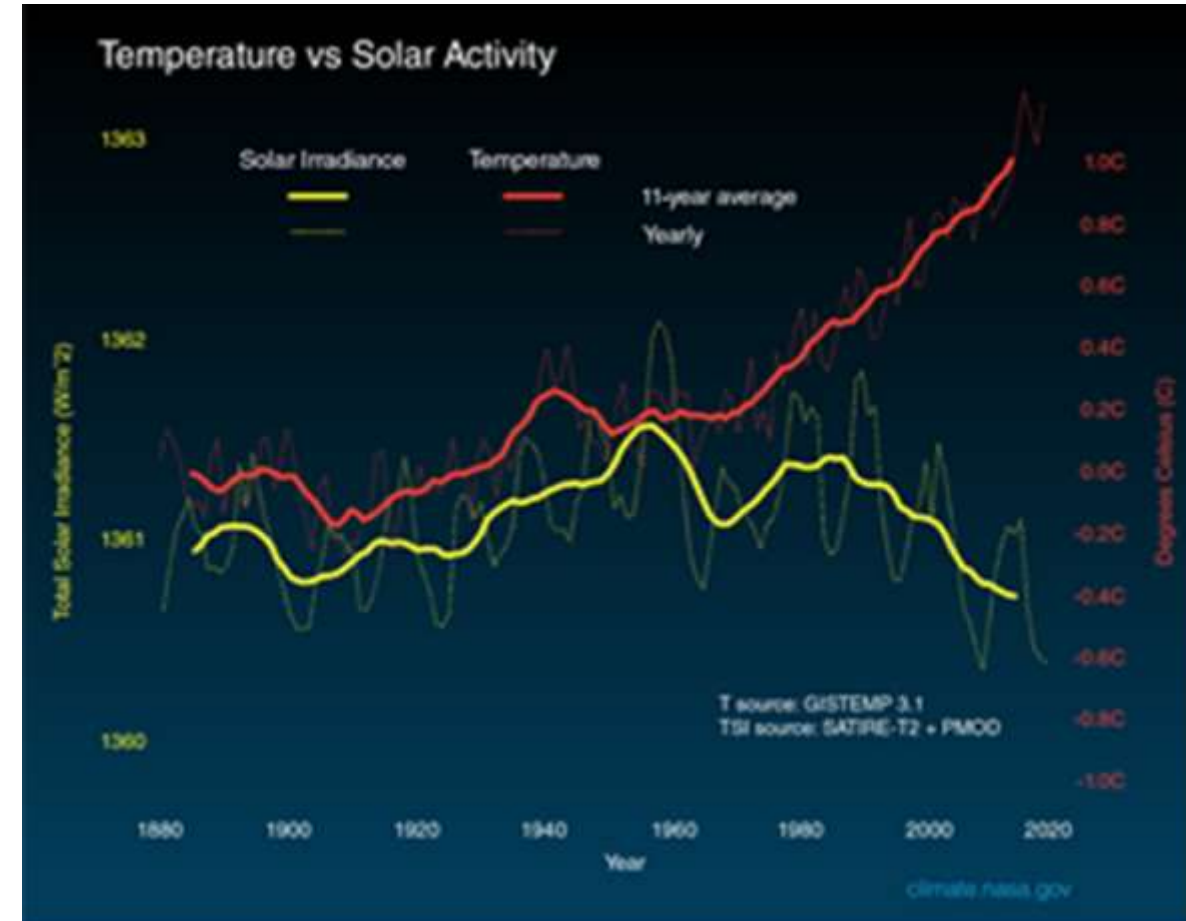


- The model of Milutin Milanković, in all its complexity, shows full analogy with the requirements.
- From the energy perspective, the climate is indeed a mix of energy conversions produced in the interaction between electromagnetic energy from the Sun, controlled by the gravitational forces, and matter of the planet.
- The energy of electromagnetic radiation alone directed to Earth is substantial, about 173.5 petawatt ($10^{15}W$), calculated from Solar constant!



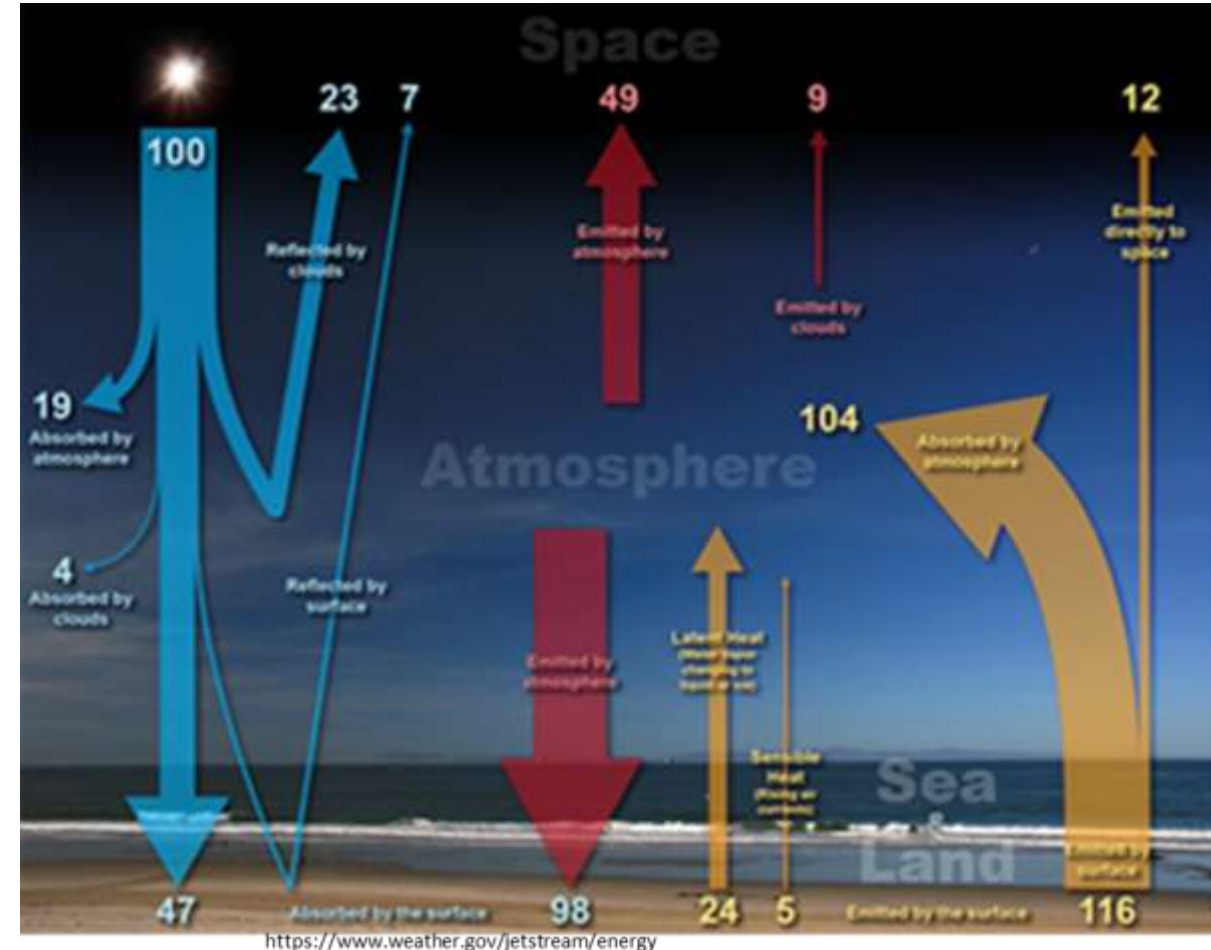


- Variations in energy influx caused by the changes of any of the factors involved will cause variations in energy conversions/climate, including any values that are taken as constant.
- At the time when the simulation was made, about 60% of total solar energy was taken into the heat budget of the planet, while now is 47%.
- Actual measurements relating to Solar Constant (that passed with minor corrections over time) and temperature rise, confirming that the temperature increase is not related to changes in solar radiation.





- Milanković had a very interesting and intriguing comment related to climate changes caused by the variation of the atmosphere content.
- Project Xenon1T.
- Dr. Svante Arrhenius, a founder of the greenhouse effect theory, confirmed change in energy by applying quantum mechanics.
- From an energy perspective, we can conclude that, by changing the chemical content of the atmosphere, we are changing composition of energy that we receive, and, according to Milanković, increasing dark energy content.





- The energy conversions identified within the heat budget are:
 - ❖ Infrared (about 40%) provides us with a sufficient temperature and induce all kinds of hydro energy, wave, sea currents, tidal, metabolic energy exchange, wind, OTEC (Ocean Thermal Energy Conversion) and CSP (Concentrated Solar Power) power generation technologies,
 - ❖ Visible (about 50%) and near Ultra Violet (about 6%) converts into chemical energy like creating sugar with photosynthesis, old reserves called "the fossil fuels", and provide electricity from PV (Photovoltaic) technologies,
 - ❖ A unique conditions on Earth have allowed the development of energy conversion that we call life.
 - ❖ I am sure that, with a better understanding of energy, we will be able to identify more conversions.



<https://thumbs.dreamstime.com/b/happy-kids-jumping-together-sunny-day-park-74041961.jpg>

6. CONCLUSION

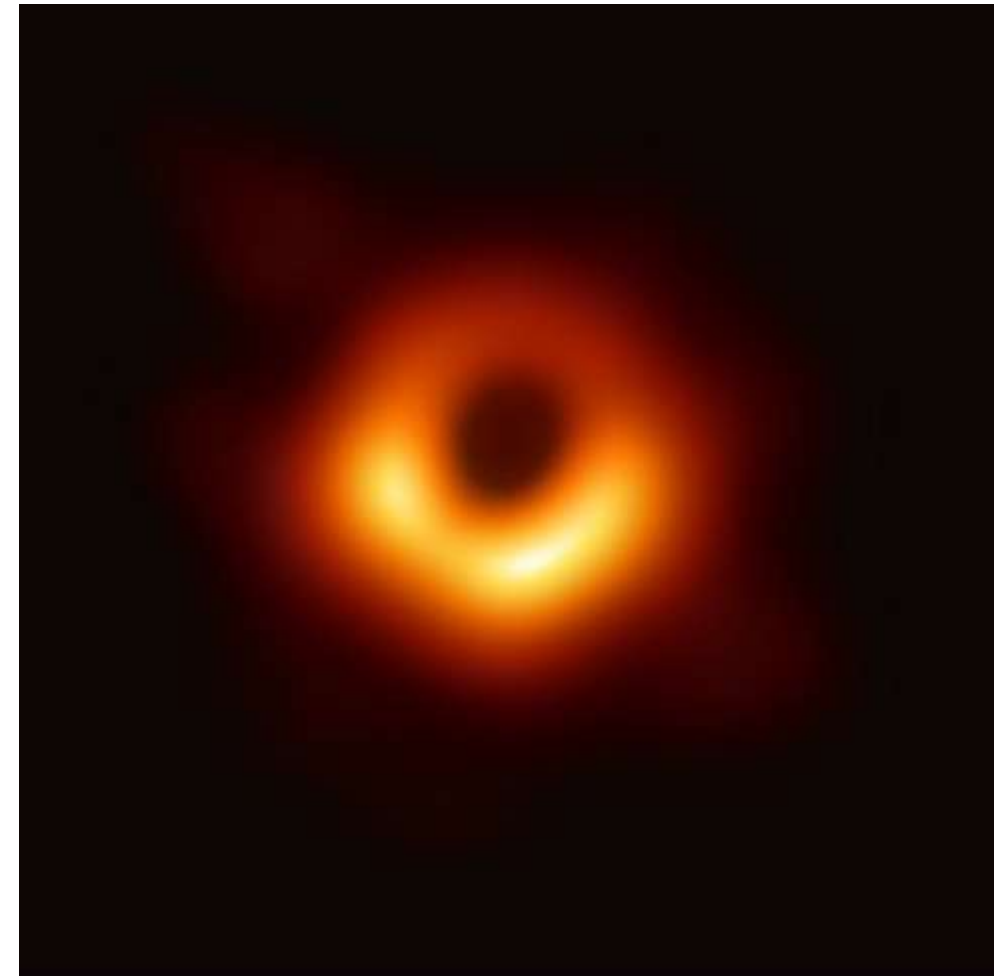


- The simulation of Prof. Milanković provides us with a missing link between space and Earth, and known and unknown.
- It gives us a deeper understanding of what is energy, as a part of the Earth's heat budget.
- By establishing the influence of electromagnetic radiation on our climate, Milutin Milanković explained the fundamental relationship between energy and the matter from which everything is created.





- Understanding, defining, and modeling the interaction of energies and matter need further development.
- The work of Milutin Milanković contains all natural laws related to electromagnetic energy from the Sun, but it is just a part of the information needed to understand our total energy budget.
- Dark matter and dark energy are much more dominant content of the universe, which only indicates a variety of possibilities that we do not know about.
- So, all this impressive knowledge becomes a part of something new and far greater, a base and the guide for further research, the physical and scientific connection between us and the cosmos, an introduction to cosmic energies, and forces conversions.



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