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## Il ciclo dell acqua seconda elementare

Initial Publication Date: July 5, 2011 To start the investigation of Earth's energy balance, you will begin by taking an in-depth look at a familiar process known as the water cycle. Earth's water supply is recycled in a continuous process known as the water, or hydrologic hydrologic cycle: the process of evaporation, vertical and horizontal transport of vapor, condensation, precipitation, and the flow of water from continents to oceans., cycle. Water molecules continuously move from location to location in this cycle. The water cycle is important to weather and climate and, ultimately, to all life on Earth. The water cycle is driven primarily by the energy from the sun. This solar energy drives the cycle by evaporating water from the oceans, lakes, rivers, and even the soil. Other water moves from plants to the atmosphere through the process of transpiration. As liquid water evaporates or transpires, it forms water vapor and clouds, where water droplets eventually gain enough mass to fall back to Earth as precipitation. The precipitation then becomes run-off or ground water, and works its way—over various timescales—back into the surface reservoirs. The water cycle is essentially a closed system, meaning that the volume of water that is in the hydrosphere today is the same amount of water that has always been present in the Earth system. Begin this lab by watching the following short NASA animation demonstrating the path of one water molecule through the water cycle. While watching the animation, make a list and keep track of all the places that the molecule travels. Note: In the NASA animation, the depiction of the water reservoirs, such as underground aquifers/aquifers: underground water reservoirs that form in the spaces and cracks between rocks, sand, or gravel, where water travels relatively easily., has been simplified to show the molecule pathways. To view this video please enable JavaScript, and consider upgrading to a web browser that supports HTML5 video Courtesy of NASA/Goddard Space Flight Center Source: NASA Click Water Cycle Animation to view the animation in a new window. As discussed earlier, the water cycle not only redistributes water around Earth, it also absorbs and redistributes solar energy between locations. Latent heating/Latent heating: the energy required to change a substance to a higher state of matter (solid to liquid, or liquid to gas). This same energy is released from the substance when the change of state is reversed (gas to liquid, or liquid to solid). of Earth's atmosphere occurs as energy, primarily from the sun, causes liquid water to transform to another phase. As this occurs, liquid water absorbs energy, causing it to evaporate and form water vapor. The process of evaporation absorbs tremendous amounts of incoming solar energy. Through the process of latent heating, energy is transferred into the atmosphere when the water vapor condenses during the formation of clouds. For example, think of how a puddle, following a rainstorm, keeps a sidewalk cool until it is completely dried by the sunshine. The incoming solar radiation is being used to drive the process of evaporation. Once the water is gone, the sidewalk begins to absorb solar radiation and heat up. If you touch the sidewalk with bare feet you can feel this sensible heatsensible heat: the excess radiative energy that has passed from Earth's surface to the atmosphere through advection, conduction, and convection processes.. A second mechanism for the redistribution of thermal energy is the process of convectionconvection: the transfer of thermal energy by the movement of heated material from one place to another., which is the driving force behind weather. Together, these two processes account for a significant amount of the Earth's radiation budget. In total, energy leaves Earth's surface through three processes: evaporation and condensation (or latent heating and cooling), convection, and emission of thermal infrared radiation. Of these three processes, 25 percent of the energy that leaves the surface of the Earth is through evaporation and condensation. An additional five percent, leaves the surface through convection. As you complete the following lab, look for signs of these two important heat transfer processes.In this lab you will build a physical model of the hydrologic, or water cycle. Materials needed for this lab include: Clear glass or plastic aquarium or shoebox Lid for aquarium or shoe box, can be a piece of cardboard or plastic wrap Rubber bands to hold the plastic wrap in place, if used. Hint: The several shorter rubber bands together to make one large one. A gallon- or quart-sized ziplock bag filled with sand, gravel or soil Warm water Blue food coloring (optional) Jar lid or small bowl Ice Small insulated cup or ziplock bag for ice Light source: bright sunlight or lamp (40-60W). If using a lamp, desk or clamp-on type lamp works best. Once you have completed this lab answer the Discussion and Stop and Think questions below. Once you have produced your water cycle model, critique its effectiveness and validity. Which parts of the water cycle were clearly demonstrated with this lab and which parts were not well represented? How might you document and share your demonstration with other students? Draw a sketch of you water cycle model and add words to describe the processes taking place in the model. Stop and Think Relate each part of your model to the water cycle diagram at the top right of this page. For example, the lamp represented the sun. What other Earth system processes were demonstrated in this lab? What was the energy source for the water cycle? How does the water cycle "transport" energy? What do you think would happen if you added a second or even third lamp? Describe what you think would happen if you left the water cycle in a shoebox in the dark for several hours. Page 2 Skip to Main ContentSkip to Navigation EarthLabs > Climate and the Biosphere > Lab 2: Climate and Earth's Energy Balance > 2B: Following the Energy Flow Initial Publication Date: July 5, 2011 Solar power drives Earth's climate. Energy from the sun heats Earth's surface, warms the atmosphere, provides energy for photosynthesis, causes evaporation, drives the weather and water cycles, and powers the ocean currents. In the astronaut photograph at right, taken from the International Space Station, you can see the sun setting through the atmosphere. When we look up at the sky from the ground, the atmosphere seems to go on forever, but in reality it is extremely thin when compared to the diameter of Earth. To get a sense of the thickness of the troposphere and stratosphere, two important layers of the atmosphere, try this simple exercise. Use a compass to draw a circle with a radius of 127 mm. This circle represents the Earth and the inner-most atmosphere. The 1 mm line, that your pencil draws, represents the average thickness of the the first two layers of the atmosphere: the troposphere, the region of weather, and the stratosphere, which protects us from most of the Sun's harmful ultraviolet (UV) radiation. As you work through the these labs keep this relative scale in mind.HideIn the example below, the line represents the thickness of the atmosphere to the top of the stratosphere (@50 km above the surface). Ninety-nine percent of the mass of the atmosphere's gases are within 32 km of Earth's surface, in these two layers. The troposphere alone contains 75-80 percent of the mass of the atmosphere. The outer edge of the 1 mm line would be 128 mm from the center of the arc (Earth radius = 6371 km). In the picture below, pixels are used as a measure of distance. To get a feel for how "thin" the atmosphere is, you might want to try this activity outdoors, using a scale of meters. Radiation is the transfer of energy by electromagnetic waves. You have probably seen a heat lamp warming food in a cafeteria; the heat lamp is using one type of long-wave electromagnetic radiation, infraredinfrared radiation: the long wave, electromagnetic radiation of radiant heat emitted by all hot objects. On the electromagnetic spectrum, it can be found between microwave radiation and visible light. light waves, to heat the food. Energy is transferred from the sun to Earth via electromagnetic waves, or radiation. Most of the energy that passes through the upper atmosphere and reaches Earth's surface is in two forms, visible and infrared light. The majority of this light is in the visible spectrum. As sunlight enters the Earth system one of two different things can happen: it can either be absorbed or reflected. Once energy has been absorbed by the Earth system, it is transformed and transferred. Eventually, after multiple transfers, this radiation is emitted back to space, keeping our planet in an energy equilibrium. All matter is made of particles, such as atoms and molecules. These particles are always in motion; this motion is known as kinetic energy. The thermal energy of a unit of matter is the total kinetic energy of all the particles in a given volume, which we measure as temperature. The transfer of energy from one region to another is called heat. This transfer of energy can take place by three processes: radiation, conduction, and convection. Thermal energy, or heat, always moves from things that are warmer (have more energy) to things that are cooler (have less energy). For example, when you touch an ice cube with your warm hand, the energy is transferred from your hand to the ice cube, causing it to melt. The heat from your hand causes the temperature of the ice to rise — this is called sensible heat because it can be sensed or measured with a thermometer. Once the ice begins to melt, the heat is no longer changing the ice's temperature but now changing its phase, in this case from ice to water — this use of heat in phase change is what's known latent heat. In this lab, you will examine the complex energy pathways and balance that helps to keep our planet within an ideal temperature range. The energy budget To begin, watch the video below and take notes on what you learn. You'll get a sense of how the solar energy moves through space; bathing our planet and its atmosphere. The radiation that arrives at the top of the atmosphere is either reflected or absorbed. Read through the first five slides in the PDF that you downloaded (above). Start with 100 objects (i.e., pennies). Separate them into five columns on a piece of paper as follows. These pennies represent 100 percent of the solar energy coming from the sun, or 100 units. Stack the pennies according to what happens to each unit of energy as it travels through the atmosphere on its way to Earth's surface, as is diagrammed above. 23 units = reflected by the clouds and atmosphere 7 units = reflected by the Earth's surface 19 units = absorbed by the atmosphere (ozone, aerosols, dust) 4 units = absorbed by clouds 47 units = absorbed by the Earth surfaces (primarily ocean) Next, add up and record the total units in your student notebook. Total the pennies that were reflected; you should have 30. Total the pennies that were absorbed; you should have 70. These pennies represent the amount of radiation that has entered the Earth's energy system. Some of this energy is now in the atmosphere (23 units) while the rest has been absorbed by the Earth (specifically, the hydrosphere, biosphere, and lithosphere - 47 units). HidePart 1 results Part 2. Surface Energy Budget In Part 1, you saw that about 30 percent of incoming sunlight is reflected back to space by particles in the atmosphere or bright ground surfaces, which leaves about 70 percent to be absorbed by the atmosphere (23 percent) and Earth's surface (47 percent) including the ocean. For the energy budget at Earth's surface to balance, processes on the surface must transfer and transform the 47 percent of incoming solar energy that the ocean and land surfaces absorbed back into the atmosphere and eventually space. Energy leaves the surface through three key processes: evaporation, convection, and emission of thermal infrared (IR) radiation. Read the next three slides (Part 2) of the PDF that you downloaded (above). Transfer the 47 pennies, which represent the absorbed energy in the Earth system, to a new piece of paper. This energy, which has been absorbed by the surface of the Earth, will now be transferred back to the atmosphere via several processes. To represent this, stack the pennies in four new columns as follows. 24 units = latent heat: energy that is used in evaporation, transpiration, and condensation 5 units = sensible heat: energy that drives convection 12 units = emitted from Earth directly back to space 6 units = net radiation amount absorbed by atmosphere HideThis is the long-wave radiation that is emitted from Earth's surface to the atmosphere (116), minus the energy that is directly transferred to space (12) combined with that which re-radiated back to Earth by the atmosphere (98). The equation would be: [(116-(12+98))]= 6 Record these numbers in your student notebook. HidePart 2 results Part 3. The Atmosphere's Energy Budget The third step of the process moves the energy from the atmosphere back to space, through the following processes. Read the next two slides (Part 3) of the PDF that you downloaded (above). Collect the 19 and 4 pennies, which were absorbed by the atmosphere and clouds. Collect the 24 and 5 pennies, which were transferred to the atmosphere via latent and sensible heat. Collect the 6 pennies that remained in the atmosphere. Move these 58 pennies to two remaining locations in the following amounts: 49 units = emitted by the atmosphere 9 units = emitted by clouds Total the three boxes on the top-right of the sheet. These are units of long-wave radiation transferred by the atmosphere back into space. Record these numbers on your piece of paper as a bar chart or histogram. Add up the total number of pennies that you have on your paper. HidePart 3 results When you are done, answer the Checking In questions, below. What is your total? Are there any pennies left over? Where are they, and what do they represent? HideAll of the pennies should now be back in space in order for your global energy budget to balance. What do you think would happen if you changed the amount of energy that was reflected by the atmosphere or Earth's surface? Can you think of an example when this might happen? HideSome types of clouds reflect sunlight, other particles, such as the ash from volcanoes, are also highly reflective to solar energy. Increases in the reflectivity of the Earth take place when the continents and oceans are covered with ice and snow. Either less incoming, or less absorbed radiation, would cause the system to cool. How does radiation get back out of the system? How is it emitted, and how is it transformed? Give several examples. HideLatent heat is an example of how solar radiation is transformed from electromagnetic radiation to the kinetic energy of water molecules. Sensible heat, can be detected as heat by thermometers. Temperature change is an indicator that solar radiation has been absorbed by a surface. As air is heated by surfaces or solar radiation, it triggers convection currents, sometimes called thermals. Other absorbed solar radiation is emitted from surfaces as longwave (or infrared) radiation and then eventually moves back out into space via the atmosphere. Return to the Energy Balance video, above. Review the video one more time with the energy accountant steps in mind. Then answer the Stop and Think questions below. Stop and Think 6. Now that you have worked through the Earth's energy balance, discuss how changes in Earth's surface characteristics and / or atmospheric composition could contribute to global warming or cooling. 7. Complete the following phrases and add one of your own: More radiation = \_\_\_\_\_ warming Less reflection = \_\_\_\_\_ warming More absorption = \_\_\_\_\_ warming \_\_\_\_\_ How do we know what we know? Measuring Earth's radiation balance is an enormous and important task! How can we accurately and simultaneously know how much energy is coming into the Earth system, being reflected by clouds, and being emitted back to space? To gain a global understanding of this balance, scientists use instruments on satellites. The following video explains how the Clouds and the Earth's Radiant Energy System (CERES) sensors on NASA's Aqua and Terra satellites measure Earth's Energy balance. Optional Extension The CERES mission homepage contains more information about how NASA science missions are measuring Earth's energy balance. Additional background information, datasets, and details about Earth's Energy Balance can be found at the following links: NWS Jetstream - The Earth-Atmosphere Energy Balance website has additional explanations, diagrams and a short explanation of how cloud cover can contribute to warmer night time temperatures. HideThe units on the diagrams in this exercise are in terms of percentages of the incoming 342 watts per meter2 of solar energy. These percentages may not be exactly the same in every diagram, as there is some variation in scientists' explanation about how much energy is in each part of the system. Video explaining energy and heat transfer from South Central Climate Adaptation Science Center Hide Flash is no longer supported To view this video please enable JavaScript, and consider upgrading to a web browser that supports HTML5 video Energy Flow from TERC & informmation \*This video replaces a Flash animation. To view this video please enable JavaScript, and consider upgrading to a web browser that supports HTML5 video from University of California, San Diego. by Memorie Yasuda & Wesley Bellanca \*This video replaces a Flash interactive. « Previous Page Next Page » IL CICLO Dell'acqua Il sole scalda l'acqua del mare. L'acqua si trasforma in vapore acqueo. Il vapore acqueo sale in alto. Il vento spinge il vapore acqueo sulla terra. L'aria fredda trasforma il vapore acqueo in goccioline. Quando il freddo aumenta il vapore acqueo diventa neve. L'acqua scorre nei fiumi e nei ruscelli. I fiumi riportano l'acqua al mare, qui alcuni spunti IL FANTASTICO VIAGGIO DEL SIGNOR ACQUA BUON LAVORO, SIGNOR ACQUA! IL FANTASTICO VIAGGIO DEL SIGNOR ACQUA QUI IL FILE il ciclo dell'acqua QUI ALCUNI CONSIGLI Il fantastico viaggio del signor Acqua Il giro del mondo col signor Acqua. Ediz. a colori Buon lavoro, signor Acqua! Ediz. illustrata Le avventure di Gocciolina Nuove avventure di gocciolina Le avventure di una gocciolina Vi ricordo la mia pagina FB, Maestra Mile Seguitemi anche su INSTAGRAM e su PINTEREST Vi aspetto, mi raccomando! Se avete dubbio contattarmi, cercherò di rispondervi subito. In questo articolo sono presenti uno o più link di affiliazione In questa pagina sono presenti link di affiliazione che garantiscono a questo sito una piccola quota di ricavi, senza variazione del prezzo per l'acquirente. PubblicitàPubblicitàPubblicità

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