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| **K.WEA Weather** |
| Students who demonstrate understanding can:  **a. Carry out an investigation to determine the effect of sunlight on natural materials on Earth’s surface.** [Clarification Statement: Examples of natural resources on the Earth’s surface that can be investigated are rocks, water, soil, or sand.] [Assessment Boundary: Quantitative comparisons of data are limited to comparing numbers.]  **b. Observe, record, and share findings of local weather over a period of time**. [Clarification Statement: Students can observe local weather data such as sunlight, wind, snow, rain, and temperature over multiple time periods such as hourly, daily, weekly, and over the school year.] [Assessment Boundary: Climate is not assessed.]  **c. Develop, use, and share representations of weather conditions to describe changes over time and identify patterns.** [Assessment Boundary: Not to include histograms and line graphs.]  **d. Analyze weather data to determine that some kinds of severe weather are more likely to occur than others in the local region.** [Clarification Statement: Students can use weather data to compare likelihood of events such as rain vs. hurricane; typical temperature vs. heat wave; wind vs. tornado.] [Assessment Boundary: Limited to students' local region.]  **e. Ask questions and obtain information on how forecasting of severe weather can help keep people safe.** [Assessment Boundary: Students are not expected to make measurements of weather data or to forecast weather.] |

**NEXT GENERATION SCIENCE STANDARDS – WEATHER**

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| **3.WCI Weather, Climate, and Impacts** |
| Students who demonstrate understanding can:  **a. Use mathematics and computational thinking to observe and record local weather data over time using standard units.** [Clarification Statement: Examples of weather data to observe includes temperature, precipitation, wind speed, or wind direction. Students should use standards units such as degrees and centimeters per year.]  **b. Analyze and interpret weather data to identify day-to-day variations as well as long-term patterns.** [Clarification Statement: Examples of weather data could include maps and forecasts. Students should address climate in terms of long term patterns.]  **c. Obtain information about different climatic areas to predict typical weather conditions expected in a particular season in a given area.** [Clarification Statement: Examples of climatic areas could include tropical, dry, temperate/moderate, tundra, cold, or polar. The focus is not on addressing each of the areas, rather students should be able to predict typical conditions based on a set of information.]  **d. Obtain and evaluate information about a variety of weather-related hazards that result from natural processes, as well as their environmental and societal impacts.** [Clarification Statement: Examples of natural processes could include severe weather, floods, or coastal erosion.] [Assessment Boundary: Natural hazards limited to weather-related hazards.]  **e. Collaboratively design, compare, and refine solutions that reduce the environmental or societal impact of a weather-related hazard.** [Clarification Statement: Examples of solutions to weather-related hazards could be physical models of barriers to prevent flooding or physical models of buildings that withstand high winds.] [Assessment Boundary: Natural hazards limited to weather-related hazards.] |
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| **4.PSE Processes that Shape the Earth** |
| Students who demonstrate understanding can:  **a. Ask testable questions about the effects of moving water on the rate of erosion under various conditions and plan and carryout investigations to observe and document the effects.** [Clarification Statement: Examples of variables to test could be angle of slope, amount of vegetation, or volume of flow.] [Assessment Boundary: Ratios should not be included in quantitative analysis.]  **b. Obtain and communicate information about how patterns in tree rings and ice cores are used as evidence to describe the recent history of Earth’s climate.** |

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| **MS.ESS-WC Weather and Climate Systems** |
| Students who demonstrate understanding can:  **a. Generate and revise causal explanations given specific temperature and precipitation data sets at different geographic locations to answer questions about interactions that influence weather.** [Clarification Statement: Factors that interact and influence weather should include sunlight, ocean, atmosphere, ice, landforms and living things.] [Assessment Boundary: Students consider interactions between only two variables at a time.]  **b. Construct models to describe and explain how circulation in the atmosphere and ocean results from unequal heating of Earth’s surface and is influenced by latitude, altitude, geography, and Earth’s rotation.** [Clarification Statement: Atmospheric and oceanic circulation may include Hadley cells, the Gulf Stream, and the prevailing westerlies and trade winds.] [Assessment Boundary: Students do not need to explain the mechanism causing the Coriolis effect.]  **c. Use mathematics to analyze weather data and forecasts to identify patterns and variations that cause weather forecasts to be issued in terms of probabilities.** [Clarification Statement: Averages and basic probability should be used to analyze weather data.]  **d. Construct explanations, from models of oceanic and atmospheric circulation, for the development of local and regional climates.** [Assessment Boundary: Students should construct explanations for their own local climate.]  **e. Use models of Earth’s atmosphere and surface to explain how energy from the sun is absorbed and retained by various greenhouse gases in Earth’s atmosphere, thereby regulating Earth’s average surface temperature and keeping Earth habitable.** [Assessment Boundary: Explanations should include an understanding that energy can take different forms and can be tracked as it moves through Earth’s systems. Students do not have to explain the differing wavelengths of radiation received and reemitted from Earth’s surface. Amount of energy absorbed by different reservoirs is not assessed at this level.]  **f. Construct a model to track and explain the inputs, outputs, pathways, and storage of carbon among the geosphere, biosphere, hydrosphere, and atmosphere.** [Assessment Boundary: Details of biogeochemical reactions involving carbon and actual amounts of reactants and products are not assessed at this level.]  **g. Use argumentation to evaluate the competing demands for various human uses of fresh water and biosphere resources.** [Assessment Boundary: Arguments should take into account the uneven distribution of the resources and the natural limits to their availability.]  **h. Use maps and other visualizations to analyze large data sets that illustrate the frequency, magnitude, and resulting damage from severe weather events in order to assess the likelihood and severity of future events.** |

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| **HS.ESS-CC Climate Change** |
| Students who demonstrate understanding can:  **a. Evaluate and communicate the climate changes that can occur when certain components of the climate system are altered.** [Clarification Statement: For example, evaluate variations in incoming solar radiation as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems.]  **b. Construct a scientific argument showing that changes to any one of many different Earth and Solar System processes can affect global and regional climates.** [Clarification Statement: Examples of these processes include the sun’s energy output, Earth’s orbit and axis orientation, tectonic events, ocean circulation, volcanic activity, glacial activity, the biosphere, and human activities.] [Assessment Boundary: Use evidence from the geologic record only.]  **c. Analyze geologic evidence that past climate changes have occurred over a wide range of time scales.** [Clarification Statement: Examples of evidence are ice core data, the fossil record, sea level fluctuations, glacial features.]  **d. Engage in critical reading of scientific literature about causes of climate change over 10s-100s of years, 10s-100s of thousands of years, or 10s-100s of millions of years.** [Clarification Statement: Examples of causes are changes in solar output, ocean circulation, volcanic activity (10s-100s of years); changes to Earth’s orbit and the orientation of its axis (10s-100s of thousands of years); or long-term changes in atmospheric composition (10s-100s of millions of years).]  **e. Use global climate models in combination with other geologic data to predict and explain how human activities and natural phenomena affect climate, providing the scientific basis for planning for humanity’s future needs.** [Clarification Statement: For example, use global climate models together with topographic maps to investigate effects of sea level change or combine global climate models with precipitation maps to investigate locations where new water supplies will be needed.]  **f. Apply scientific knowledge to investigate how humans may predict and modify their impacts on future global climate systems (e.g., investigating the feasibility of geoengineering design solutions to global temperature changes).**  **g. Use models of the flow of energy between the sun and Earth’s atmosphere and surface to explain how different wavelengths of energy are absorbed and retained by various greenhouse gases in Earth’s atmosphere, thereby affecting Earth’s radiative balance.** [Clarification Statement: Students will work with absorption spectra of different Earth materials.] |