Weather and climate worksheets for grade 6

NASA and NOAA combined reported that 2016 was the warmest year on record. This is no surprise, as the first six months of the year were all extremely warm. But the news is important to what it says about global warming: Before 2016, 10 of the hottest years happened. And last year, a new world annual temperature record was set for the third year in a row. Despite the lingering record-breaking heat planet around the world, skepticism over anthropogenic or human warming remains. For some, the fact that meteorologists cannot reliably predict weather days ahead is proof that scientists cannot predict Earth's climate years or decades from now. Why do scientists like me have confidence in predicting record heat months ahead and how do climate forecasts differ from weather forecasts? Weather forecasts Based on atmospheric trends, the weather forecasts take into account the evolution of weather systems, including atmospheric pressure patterns. Atmospheric pressure is the force weighted by air molecules. Areas where the air sinks have high pressure, and generally warm and fair weather. Low pressure systems, also known as cyclones, occur where the air rises and usually produces colder and moist weather. The map shows the ranking for the annual average temperature for 2016 by country. The rankings refer to the 122-year record period from 1895 to 2016. 2016 was the second warmest year on record for the compressed U.S. [Chart: via NOAA] The accuracy of weather forecasts up to about two weeks of broadcasts has improved dramatically in recent years. But atmospheric systems don't last long, and forecasts that go beyond that time frame become much less accurate. For example, predicting the formation of a low pressure system (cyclogenesis) and movement across the east coast of the US poses a challenge. A deviation from the predicted track just 80 miles east or west could mean the difference between a blizzard, a windy rainstorm or a nearby miss. Similarly, forecasts of the amount of rain that will fall on a hot summer's day can be very uncertain. When a forecast requires isolated storms, factors are expected to control the formation of storms, such as daily heating, moisture flow and upper-level winds. However, these factors develop considerably during a given day, making it difficult to predict total rainfall, especially in a small area. So it's hard to say if it will rain on your parade or the next site over-the-term pop-up storm is apt. That doesn't mean we can't trust severe storm warnings. In this case, forecasts of severe weather are often made for larger geographical regions and only when conditions exist. Factors that produce severe weather extend to a larger area compared to those leading to isolated storms. Technological including better radar and the use of super-computers, also lead to more accurate weather forecasts. The role of Ocean HeatIn contrast to forecasts based on the movement of transitional weather systems, climate forecasts around temperature and precipitation, for example, use completely different datasss. To predict several months to decades into the future, scientists are using ocean changes, other natural factors (solar changes, volcanic eruptions) and the growing impacts of rising greenhouse gas concentrations (GHG) in the atmosphere. These variables develop and have an impact in months and years, unlike atmospheric pressure patterns, which can change in a matter of hours or days. An important factor with an effect of several months to about a year is El Niño, a periodic warming of ocean temperatures across the tropical Pacific. This pattern of ocean warming and the associated effects on the atmosphere has a profound impact beyond the trops, which can affect climate predictions. This map shows mixed soil anomalies and surface temperatures at sea, or changes from historical average, for 2016 in degrees Celsius. [Chart: through NOAA National Environmental Information Centers] Data on ocean temperatures are critical because most of the solar radiation that has engulfed Earth is absorbed by the world's oceans. Guided by this energy, the oceans and the atmosphere spread heat around the world. Years after El Niño are usually warmer than those with near-normal (also known as neutral) or La Niña conditions. The presence of La Niña often reduces the global temperature. This tells us that the relative amount of heat in the surface waters of the tropical Pacific can be used to predict global temperatures a few months in advance, which is exactly what happened in last year's record temperature forecast. In December 2015, the U.S. Office of 2016 predicted that 2016 would be a record warm year, between 0.72 and 0.96 degrees Celsius above the long-term (1961-1990) average. Their forecast today that 2016 was 0.77°C above average is within the forecast range. In early 2016, Gavin Schmidt of NASA's Goddard Institute for Space Studies predicted that 2016 would be 1.3°C above late 19th-century temperatures. What about 2017? In an update on Jan 12, NOAA announced a transition from weak La Nine to neutral conditions in the first half of 2017. The impact of La Niña earlier this year is central to forecasts that 2017 will be slightly colder than 2016, but still among the hottest years on record. Global annual average temperature anomaly near the surface (i.e. the difference in temperature from the average from 1961-1990 in degrees Celsius) between 1850 and 2015. The value for 2016 is on average January to October. Grey line and shadow shows 95 per cent Range. The forecast value for 2017 and its extent of uncertainty are shown in green and black. [Chart: via uk Met Office] It should be added that the record heat of 2016 was not just due to El Niño. Indeed, El Niño years are getting warmer than those with La Niña, due to the overall warming trend from rising GHG concentrations. The combined impact of human and natural factors over time, other natural factors are known to affect the rate of warming. Large volcanic eruptions, especially those in the tropics, can have a cooling effect globally by blocking solar radiation. For example, the eruption of Mt. Pinatuba in 1991 caused the average global temperature to drop by about 1 degree Fahrenheit (0.6°C). Cooling, however, is usually short-lived and ends when volcanic aerosols–small particles block out sunlight-rain. Changes in solar output energy can also affect the climate. However, the observed trend of warming in recent decades cannot be attributed to changes in the sun. The impact of solar variability on climate change is evident, but the effect of GHGs has briefly proved to be much more significant. The projections of warming over longer time scales– several decades or longer– are based on simulations of climate models and our understanding of how sensitive the climate system is to future increases in greenhouse gas concentrations in the future. The models showed that future warming would outweigh rising greenhouse gas levels compared to the variability of internal oceans and other natural factors. Warming will be exacerbated by feedback including carbon cycle, atmospheric moisture and other factors. For example, water vapour is a powerful GHG, so increasing atmospheric moisture will intensify warming. Emissions from the Arctic are also particularly concerned and threaten to shift the Arctic from a carbon trough to a resource. Sixteen of the 17 hottest years have happened this century. There is a great scientific consensus that human actions are warming the planet. At the same time, we continue to improve weather and climate forecasts, leading us to have a deeper understanding of the behaviour of climate systems at different times and in multiple spatial scales. This research will improve accuracy and confidence in projections for the future. The author is an associate professor at the University of Massachusetts Amherst and head of the Research Center for Climate Systems. This story originally appeared in The Conversation. Chile extends over 38 degrees latitude with a climate that extends from the desert to the ice cap, making generalization here impossible. Chile's climate includes Mediterranean, Alpine, tundra, desert, temperate, subtropical and semi-auous. Chile has a regional climate that suits every taste... The Atacama Desert is the dryest place in the world; The island and Central Chile have balm and a comfortable warm year; Zona Sur and the northern Zona Austral are in a windy, windy and cold year; The southern Zona Austral is the coldest part of South America and is known for its seasonal stability, here it rains and snows, but average temperatures rarely fall below freezing. Most regions in Chile experience a seasonal change. Summer weather in most regions of Chile is generally great, with warm sunny days and cold nights, making it a good place to drive from the North American winter. If you're looking for a four-season retirement, that's one of your best options. Chile lies on the Ring of Fire, an area that is submissing to earthquakes and volcanic eruptions. A underked-shaped ring of fire flows along the Pacific coasts of North and South America, across the Bering Strait and along the coast of Asia into the Pacific Basin. Almost all the great earthquakes in the world happen in this area. Most of the world's active and dormant volcanoes are here, too. The most powerful earthquake in history hit Valdivia in Chile in 1960. The largest earthquakes in Chile since 1900 (as far as accurate measurements are concerned) occurred in southern Chile. In Chile, on average, there is at least one earthquake per year. The last devastating tsunami was in 2010, and the last time an earthquake disrupted services was in 2007. And Chilean building standards offer you as much earthquake protection as you can find anywhere in the world. As in all countries, the weather depends on your region, perhaps more in Chile than anywhere – and it pays to watch the forecast. Breakdown of seasons in Chile Chilean summer: December to February Chilean fall: March to May Chilean winter: June to August Chilean spring: September to November November

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