

# Earth Sciences Resource List

TROP ICSU  
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# Lesson Plans

#	Lesson Plan Title	Disciplines	Key Topics	Link
1	Lesson Plan: Carbon Cycle Regulation by Carbon Sequestration	Earth Science, Chemistry	Carbon Cycle, Carbon Sequestration	
2	Lesson Plan: Teaching Climate Change through Rap	Earth Science	Cultural Studies, Music, Hip-Hop	
3	Lesson Plan: Teach the Earth's Climate System Through Simulations (Earth-Like)	Earth Science	Earth's Climate System, Climate Change	
4	Lesson Plan: Coding with Python: Modeling the Ice Albedo Feedback	Earth Science	Snowball Earth, Milankovitch Cycles	
5	Lesson Plan: The Water Cycle in a Sustainable World	Earth Science, Chemistry	Environmental Chemistry, Water Cycle, Biogeochemical Cycles	
6	Lesson Plan: Waves and Oscillations	Earth Science	Waves, Oscillations, Simple Harmonic Motion	
7	Lesson Plan: Teach the Earth's Climate System Through Simulations (Build Your Own Earth)	Earth Science	Climate Science, Earth's Climate System, Climate Change	
8	Lesson Plan: Major Landforms: Mountains and Climate	Earth Science	Earth's Climate System, Lithosphere	

#	Lesson Plan Title	Disciplines	Key Topics	Link
9	Lesson Plan: Major River Systems: Climate Change and the River Nile	Earth Science	Hydrosphere, River Systems	
10	Lesson Plan: Himalayan Glaciers and Climate Change in Bhutan	Earth Science	Glaciers, Cryosphere	
11	Lesson Plan: Buffers, Buffer Action and Ocean Acidification	Earth Science, Chemistry	pH Scale, Ocean Acidification	
12	Lesson Plan: Permafrost and Climate Change	Earth Science	Cryosphere, Greenhouse Effect, Carbon Emissions	
13	Lesson Plan: Phase Diagrams and Phase Equilibria	Earth Science, Chemistry	Phase Diagrams, The Greenhouse Effect	
14	Lesson Plan: Heat Transport in the Atmosphere, Hadley Circulation and Climate (Global Precipitation Patterns and Distribution of Deserts)	Earth Science	Hadley Circulation, Atmospheric Physics, Heat Transport, Coriolis Force	
15	Lesson Plan: Teaching about Hazards and Disasters through Climate-related Examples (Sea-Level Rise and Flooding due to Melting of Polar Ice)	Earth Science	Disasters and Hazards, Sea Level Rise, Cryosphere	
16	Lesson Plan: Analyzing Trends and Calculating Uncertainty using Hurricane Data Records	Earth Science	Disasters and Hazards, Confidence Interval, Trend Analysis	

#	Lesson Plan Title	Disciplines	Key Topics	Link
17	Lesson Plan: Coriolis Force, Coriolis Effect, and the Impact of Coriolis Effect on Climate	Earth Science	Coriolis Force	
18	Lesson Plan: Teaching Glaciology, Glaciers and Glacial Retreat, and the Cryosphere-Climate Relationship	Earth Science	Glaciers, Cryosphere	
19	Lesson Plan: Atomic Number, Mass Number, Isotopes and Isotopic Ratios, and Isotopic Compositions as Climate Proxies	Earth Science, Chemistry	Atomic Number, Isotopes	

# Teaching Tools

#	Teaching Tool Title	Disciplines	Key Topics	Link
1	Reading: A History of Climate Models	Physics, Earth Sciences	Climate Physics, Climate Models	
2	Video: An Introduction to Atmospheric Thermodynamics	Physics, Earth Sciences	Thermodynamics, Atmospheric Physics	
3	Video: Quantum Physics	Physics, Earth Sciences	Quantum Physics, Electromagnetic Radiation, The Greenhouse Effect	
4	Video: Quantum Mechanics and Climate Change	Physics, Earth Sciences	Quantum Mechanics, Quantum Physics, Planck's Law	
5	Reading: Chaos Theory and Global Warming	Physics, Earth Sciences	Chaos Theory, Climate Models, Atmospheric Physics	
6	Classroom/Laboratory Activity: The Coriolis Effect	Physics, Earth Sciences	Coriolis Force	
7	Videos: Earth's Climate, the Biosphere, and Geological Evolution	Earth Sciences	Climate Change Overview	
8	Reading: What is the Atmosphere?	Earth Sciences, Geography	Climate Change Overview, Atmosphere	

#	Teaching Tool Title	Disciplines	Key Topics	Link
9	Reading: What is the Biosphere?	Earth Sciences, Biological Sciences	Climate Change Overview, Biosphere	
10	Reading: What is the Cryosphere?	Earth Sciences, Geography	Climate Change Overview, Cryosphere	
11	Reading: What is the Lithosphere?	Earth Sciences, Geography	Climate Change Overview, Lithosphere	
12	Reading: What is the Hydrosphere?	Earth Sciences, Geography	Climate Change Overview, Hydrosphere	
13	Reading: Climate and the Hydrosphere	Earth Sciences, Geography	Climate Change Overview, Hydrosphere	
14	Reading: Climate Change and Natural Disasters	Earth Sciences, Environmental Sciences, Geography	Disasters and Hazards	
15	Reading: Chemistry and Climate Change	Chemistry, Earth Sciences	Environmental Chemistry	
16	Reading: Climate Change: The Chemistry Connection	Chemistry, Earth Sciences	Environmental Chemistry	



#	Teaching Tool Title	Disciplines	Key Topics	Link
17	Reading: Climate Disasters: An Overview	Earth Sciences, Environmental Sciences, Geography	Climate Change Overview, Disasters and Hazards	
18	Teaching Module: Climate and the Biosphere: An Overview	Earth Sciences	Climate Change Overview, Biosphere	
19	Reading: Can People Change Climate?	Earth Sciences, Environmental Sciences, Biological Sciences	Climate Change Overview	
20	Teaching Module: Climate Adaptation and Mitigation	Earth Sciences	Climate Change Overview, Adaptation and Mitigation	
21	Video: Climate Adaptation: An Introduction	Earth Sciences	Climate Change Overview, Adaptation and Mitigation	
22	Teaching Module: Feedback Mechanisms	Earth Sciences	Feedback Mechanisms	
23	Video: Climate Change and the Lithosphere	Earth Sciences, Geography	Climate Change Overview, Lithosphere	
24	E-Learning Course: Climate Science: An Introduction	Earth Sciences, Environmental Sciences	Climate Change Overview, Climate History	

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25	Teaching Module: Earth's Climate and the Cryosphere: An Overview	Earth Sciences	Climate Change Overview, Cryosphere, Milankovitch Cycles	
26	Reading: What is the Anthroposphere?	Environmental Sciences, Humanities, Earth Sciences, Social Sciences	Climate Change Overview, Anthropology	
27	Video Lecture: First Law of Thermodynamics	Physics, Earth Sciences	Thermodynamics	
28	Video: Clausius Clayperon and the Second Law of Thermodynamics	Physics, Earth Sciences	Thermodynamics	
29	Teaching Module: Climate Change Mathematics by NASA	Earth Sciences, Mathematics and Statistics, Environmental Sciences	Trigonometry, Introduction to Statistics	
30	Video: Thermodynamics and the Hydrostatic Equation	Physics, Earth Sciences	Thermodynamics	
31	Reading: Introduction to Planetary Energy Balance	Physics, Earth Sciences	Planetary Energy Balance, The Greenhouse Effect, Electromagnetic Radiation, Stefan Boltzmann Law	

#	Teaching Tool Title	Disciplines	Key Topics	Link
33	Teaching Module: Planetary Energy Balance	Physics, Earth Sciences	Planetary Energy Balance, The Greenhouse Effect, Electromagnetic Radiation, Stefan Boltzmann Law	
34	Video: Radiative Transfer	Physics, Earth Sciences	Planetary Energy Balance, The Greenhouse Effect, Electromagnetic Radiation, Stefan Boltzmann Law	
35	Model/Simulator: Modeling Planetary Energy Balance	Earth Sciences; Physics; Computer Science	Planetary Energy Balance, The Greenhouse Effect, Climate Models, Stefan Boltzmann Law	
36	Reading: Planetary Temperatures	Physics, Earth Sciences	Planetary Energy Balance, Electromagnetic Radiation, Stefan Boltzmann Law, Planck's Law	
37	Video: Rising Sea Surface Temperature and Hurricane Intensity	Physics, Earth Sciences	Heat Transport, Conservation of Energy	
38	Video: Planck's Law and Earth's Climate	Physics, Earth Sciences	Planck's Law, Atmospheric Physics, Stefan Boltzmann Law, Climate Physics	
39	Reading: Atmospheric Dynamics and Hadley Cells	Physics, Earth Sciences	Hadley Circulation, Heat Transport	
40	Reading: Hadley Circulation	Geography, Earth Sciences, Physics	Hadley Circulation	

#	Teaching Tool Title	Disciplines	Key Topics	Link
41	Model/Simulator: Daisyworld- A Model to Explore the Gaia Hypothesis	Earth Sciences, Mathematics and Statistics, Biological Sciences	Biodiversity, Gaia Hypothesis	
42	Video: Phase Diagrams and Earth's Climate	Chemistry, Physics, Earth Sciences	Phase Diagram, Water Cycle, Biogeochemical Cycle	
43	Reading: Earth's Equable Climate	Physics, Earth Sciences	Climate Change Overview, Hadley Cells	
44	Video: Upwelling	Physics, Earth Sciences, Geography	Coriolis Force, Climate Physics, Atmospheric Physics	
45	Model/Simulator: Modeling Earth's Carbon	Earth Sciences, Mathematic and Statistics	Mathematical Modeling, Numerical Modeling, Computer Programming	
46	Video: Physics of Scattering and Greenhouse Gases	Physics, Earth Sciences	Climate Physics, Atmospheric Physics, Stefan Boltzmann Law	
47	Reading: The Carbon Dioxide Greenhouse Effect	Physics, Earth Sciences	The Greenhouse Effect, Atmospheric Physics	
48	Video: The Greenhouse Effect of the Atmosphere	Physics, Earth Sciences	Blackbody Radiation, Stefan Boltzmann Law	

#	Teaching Tool Title	Disciplines	Key Topics	Link
49	Reading: General Circulation Models of Climate	Physics, Earth Sciences	Climate Models, Climate Physics	
50	E-Learning Course: Atmospheric Science	Physics, Earth Sciences	Atmospheric Physics, Climate Physics	
51	Model/Simulator: Milankovitch Orbital Parameters	Earth Sciences; Physics; Mathematics and Statistics; Computer Science	Mathematical Modeling, Numerical Modeling, Computer Programming	
52	Teaching Module: Introduction to Statistics through Weather Forecasting	Mathematics and Statistics, Earth Sciences	Introduction to Statistics, Mean-Median-Mode, Standard Deviation	
53	Reading: Simple Atmospheric Model	Physics, Earth Sciences	Blackbody Radiation, Climate Model, Atmospheric Physics	
54	E-learning Course/Reading: 'The Discovery of Global Warming'	Physics, Earth Sciences, Environmental Sciences, Geography	Climate Change Overview	
55	Classroom/Laboratory Activity: Using Isotopes to Measure Temperatures	Chemistry, Earth Sciences	Isotopes	
56	Video: Radiation Laws	Physics, Earth Sciences	Blackbody Radiation, Stefan Boltzmann Law	

#	Teaching Tool Title	Disciplines	Key Topics	Link
57	Video: Oceans, Ocean Circulation and Sea Surface Temperatures	Earth Sciences	Thermohaline Circulation, Coriolis Force	
58	A Collection of E-Learning Courses on Climate Change	Earth Sciences, Environmental Sciences	Earth's Climate System	
59	Visualization: Show Your Stripes: Changes in Temperature	Geography, Earth Sciences, Environmental Sciences	Earth's Climate System	
60	Reading: Ocean and Cryosphere	Earth Sciences, Environmental Sciences, Humanities, Social Sciences	The Greenhouse Effect, Adaptation and Mitigation, Sea Level Rise	
61	Video: Permafrost and Climate Change	Geography, Environmental Sciences, Earth Sciences	The Greenhouse Effect	
62	Classroom/Laboratory Activity: Permafrost and Climate Change	Geography, Environmental Sciences, Earth Sciences	The Greenhouse Effect	
63	Video Micro-lecture: Ocean Buffer Chemistry	Chemistry, Environmental Sciences, Earth Sciences	pH Scale, Acids and Bases, Ocean Acidification	
64	Reading: Isotopic Compositions and Ice Cores	Chemistry, Earth Sciences	Isotopes, Atomic Number, Atomic Mass	

#	Teaching Tool Title	Disciplines	Key Topics	Link
65	Teaching Module: Orbital Forcing and Earth's Climate	Earth Sciences	Isotopes, Milankovitch Cycles	
66	E-learning Course: An Introduction to Climate Change	Earth Sciences, Environmental Sciences	Climate Change, Adaptation and Mitigation	
67	Classroom/Laboratory Activity: Reconstruction of Paleoclimate by Using Isotopic Composition Data	Chemistry, Earth Sciences	Atomic Number, Atomic Mass, Isotopes	
68	Classroom/Laboratory Activity: Climate Change, the Cryosphere, and Rising Sea Levels	Geography, Earth Sciences	Sea Level Rise, Hydrosphere, Cryosphere	
69	Classroom/Laboratory Activity: Glacial Retreat in Glacier National Park	Geography, Earth Sciences	Glaciers, Cryosphere	
70	Visualization: Melting Ice Sheets and Sea Level	Geography, Earth Sciences	Sea Level Rise, Hydrosphere	
71	Reading: Glaciers as Indicators of Climate Change	Geography, Earth Sciences	Glaciers, Cryosphere	
72	Reading: Changes in Intensity and Frequency of Hurricanes	Geography, Earth Sciences	Disasters and Hazards	

#	Teaching Tool Title	Disciplines	Key Topics	Link
73	Reading: Hurricanes and Climate Change	Geography, Earth Sciences	Disasters and Hazards	
74	Video: Sea Level Rise	Earth Sciences, Geography, Environmental Sciences	Sea Level Rise, Hydrosphere, Disasters and Hazards	
75	E-learning Course: The Earth's Climate	Earth Sciences	Climate Change Overview	
76	Reading: A Single-layer Atmosphere Model to Explain Atmospheric Warming	Earth Sciences	The Greenhouse Effect	
77	Game: NASA Climate Kids	Earth Sciences, Environmental Sciences, Geography	Climate Change Overview	
78	Model/Simulator: The Geologic Carbon Cycle and Earth's Climate	Earth Sciences	Carbon Cycle	
79	Teaching Module: The Impact of ENSO and Human Activities on River Hydrology (a case study of the Huanghe River)	Earth Sciences	Water Resources and Climate Change, River Hydrology	
80	Visualisation, Model/Simulator, Game: Build Planet Earth	Earth Sciences	Earth's Climate, Planetary Climate	



#	Teaching Tool Title	Disciplines	Key Topics	Link
81	Model/Simulator: Greenhouse Gases and Infrared Radiation	Earth Sciences	The Greenhouse Effect	
82	Visualization: Radiation Balance and the Climate of a Planet	Earth Sciences	Planetary Climate	
83	Video: The Earth System and Climate	Earth Sciences	Climate Change Overview, Earth's Climate	
84	E-learning Course: Understanding and Addressing Climate-related Challenges from China's Perspective	Earth Sciences, Economics	Climate Change Economics	