* The teaching and learning needs to be engaging hands on with connections to employers and real world contexts.
* Many of the ORSS physical science standards applied to NGSS CCC do not specifically relate to earth science standards (e.g. not related to the carbon cycle).
* Professional Development needs to be provided for how to implement teaching strategies when both Content and CCC are strong. (See 3-7).
* Earth science is a life skill important to all students and their science literacy, citizenship, and connects science to student’s own environmental well-being.

| NGSS PE | ORSS | Content | Practice  | CCC | Notes on Alignment (W=Weak) |
| --- | --- | --- | --- | --- | --- |
| HS-ESS1 Earth's Place in the Universe |
| HS-ESS1-1.Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun’s core to release energy in the form of radiation. | H.2E.3H.1P.1H.2P.3 | WWS | NNN | NNN |  |
| HS-ESS1-2.Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe. | H.2E.3H.2P.3 | P | N | NW | No explicit mention in the ORSS re: Big Bang, e.g. CCC Conservation of Energy taught in Physical Science (H.2P.3) (Ref NGSS pg 278). |
| HS-ESS1-3.Communicate scientific ideas about the way stars, over their life cycle, produce elements. | H.1E.1H.2E.3 | PS | NS | NN | Content is strong when both ORSS combined. |
| HS-ESS1-4.Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.  | H.2P.4 | W | N | N |  |
| HS-ESS1-5.Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks. | H.1E.2H.2E.1H.2E.2H.3S.3 | SSS | NNN | S | NGSS more specific than the ORSS. The difference is the evaluation of evidence. (Ref NGSS pg 280). |
| HS-ESS1-6.Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth’s formation and early history.  | H.3S.1H.2E.2H.2E.3H.3S.4 | SPP | NNN | S | New is the “early history.” Again focus on evaluating evidence. |
| HS-ESS2 Earth's Systems |
| HS-ESS2-1.Develop a model to illustrate how Earth’s internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. | H.1E.2H.2E.1H.2E.2 | PSS | NNP | P | ORSS does not incorporate the use of models. |
| HS-ESS2-2.Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems. | H.2E.1H.2E.4H.2L.2H.3S.3H.3S.5 | SSSS | NSNS | PP | ORSS discusses systems but not feedback loops and stability (Ref NGSS pg 283). H.3S.5 addresses new technologies but not cost benefit analysis. |
| HS-ESS2-3.Develop a model based on evidence of Earth’s interior to describe the cycling of matter by thermal convection.  | H.2E.1H.2E.2H.2P.3H.4D.5 | SSS | NNN | SW | Bloom’s taxonomy, NGSS has higher expectations. ORSS addresses new technology but not research and design. |
| HS-ESS2-4.Use a model to describe how variations in the flow of energy into and out of Earth’s systems result in changes in climate. | H.2E.1H.2E.2H.2P.3H.3S.3 | SSS | NNN | S | Bloom’s taxonomy, NGSS has higher expectations. (Ref NGSS pg 285.) |
| HS-ESS2-5.Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.  | All H.3H.1E.2H.1P.2H.2E.1H.2E.2H.2E.4H.2P.1H.4D.6 | SPPPPNN | SNNNNNN | PP | H.1P.2 lays the ground work for discussing this in the context of water. (Ref NGSS pg 282.)H.2E.1/H.2E.4 social/cultural contextualization. |
| HS-ESS2-6.Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.  | H.1E.2H.2E.1H.2L.1H.2E.2H.2P.2H.2P.3 | PSPP | NNNN | SS |  |
| HS-ESS2-7.Construct an argument based on evidence about the simultaneous coevolution of Earth’s systems and life on Earth. | H.2L.4H.2L.5H.2E.2H.2E.3H.2E.4H.3S.1H.3S.4H.1L.4H.2L.2H.1L.3H.2L.1 | PPSPPPPPPPP | NNNNNNNNNNN | PPPPWPPW | This addresses both how the earth systems impacts biology and how biology impacts the earth systems. (Ref NGSS pg 283.)ORSS H.2E.4 doesn’t focus on NGSS CCC of stability and change. |
| HS-ESS3 Earth and Human Activity |
| HS-ESS3-1.Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. | H.2E.4H.3S.3Other H.3H.1P.1H.2L.2H.4D.5 | SPN/WN/WP | WNNNN | P/WSPP | H.1P.1 nuclear energy to mitigate greenhouse gasses creates hazards (Ref NGSS pg 287 & 288.) |
| HS-ESS3-2.Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios. | H.4D.4H.4D.6H.2E.4H.2P.3 | SP/WSP | SNNN | SS | H.4D.6 doesn’t explicitly address macro-economics (e.g., strength and weakness vs cost-benefit).Cool capstone project. Content and CCC are strong but implementation is another issue, this is a good place to involve students at all level of government. (Ref NGSS pg 287.) |
| HS-ESS3-3.Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. | H.2L.2H.2E.2H.2E.4H.4D.5 | WWW | NNN | P/WPNP | NGSS is addressing 2 things: 1 the computational simulation which ORSS doesn’t address, and 2 the content which is listed here.This is a STEM and math connection.Requires computer modeling skills and technological support/infrastructure.H.4D.5 is partial because NGSS highlights dependency on new technology vs ORSS use of technology. (Ref NGSS pg 288.) |
| HS-ESS3-4.Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. | H.4D.4H.4D.5H.4D.6H.2E.4H.3S.5 | SWPS | SWNN | PNNNW |  |
| HS-ESS3-5.Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.  | H.1E.2H.2E.1H.2E.2H.2E.3H.2E.4H.3S.2 | W/PPPWPP | NNNNNP | PWP | Great appropriate resources available (maybe have a website with these links).House bill 2544 in 2010 discusses eco-literacy. (Ref NGSS pg 285.)Modeling is absent from ORSS H.2E.x (all). |
| HS-ESS3-6.Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.  | H.2E.4H.3S.2H.4D.1 | S | N | NWW | (Ref NGSS pg 287.)NGSS is strong on modeling and its design components, e.g. inputs/outputs boundary conditions. |