



Using GLOBE Student Data to Understand Earth System Science

GLOBE is an international science and education program that brings together students, teachers and scientists to improve student achievement in STEM education, increase environmental awareness and contribute to an understanding of Earth system science

GLOBE Students study components of their local environment — the atmosphere, hydrology, land cover, phenology, and soil — by collecting data using scientifically valid protocols. They enter the data into the GLOBE on-line database, making them available to their peers and scientists around the world. Students from more than 100 countries have submitted over 17 million environmental observations.

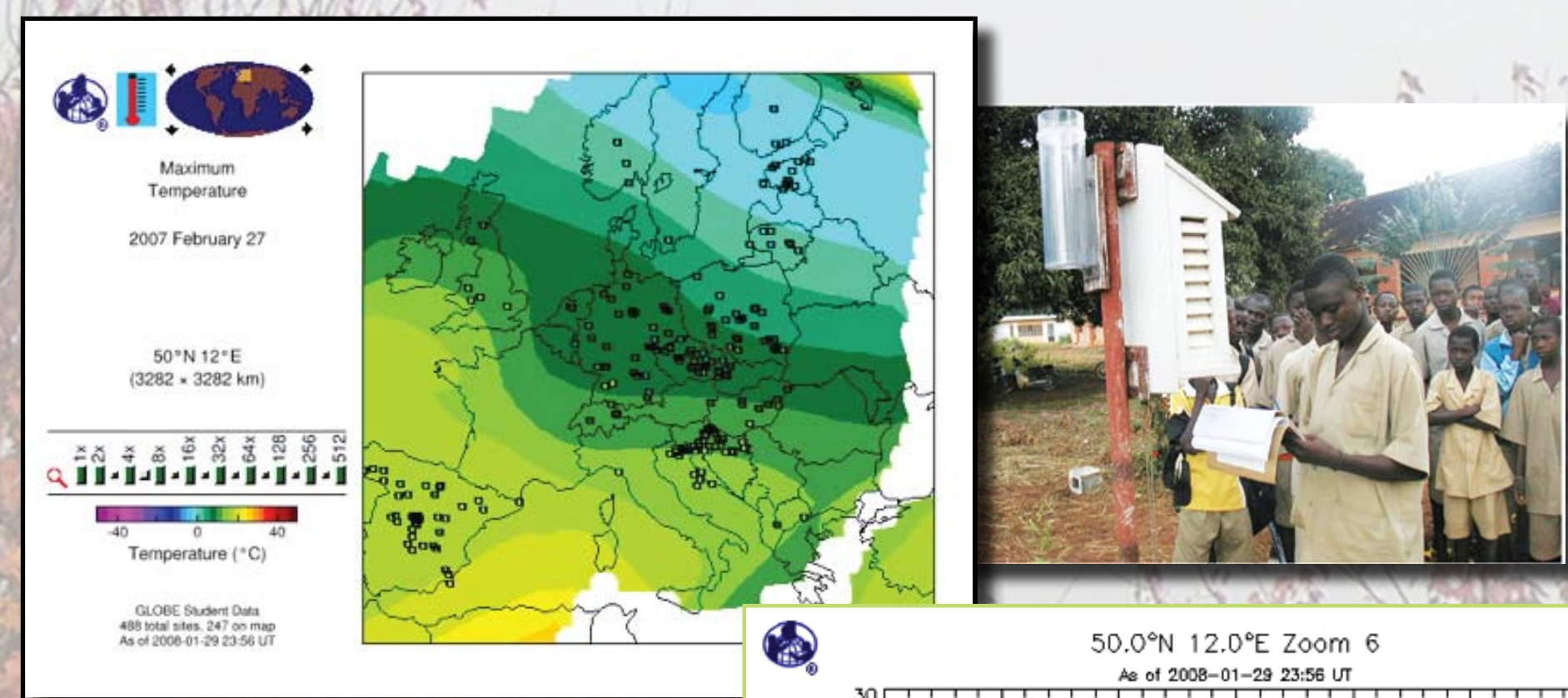


Figure 1. Maximum air temperature map

Students use these observations to gain an understanding of spatial relationships of data (See Figure 1). The GLOBE online mapping tools also allow the user to create X, Y scatter plots of the data (See Figure 2). Such plots help make the patterns easier to visualize.

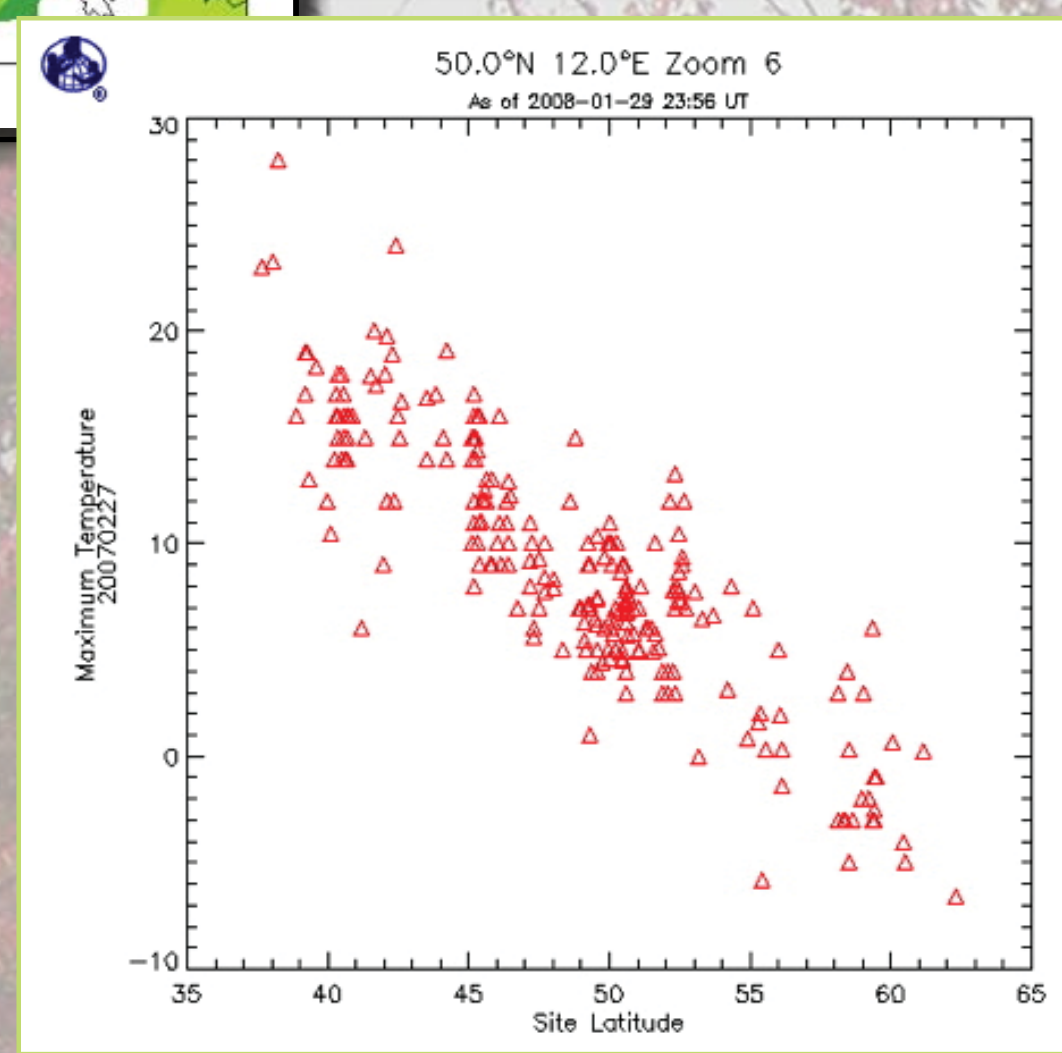
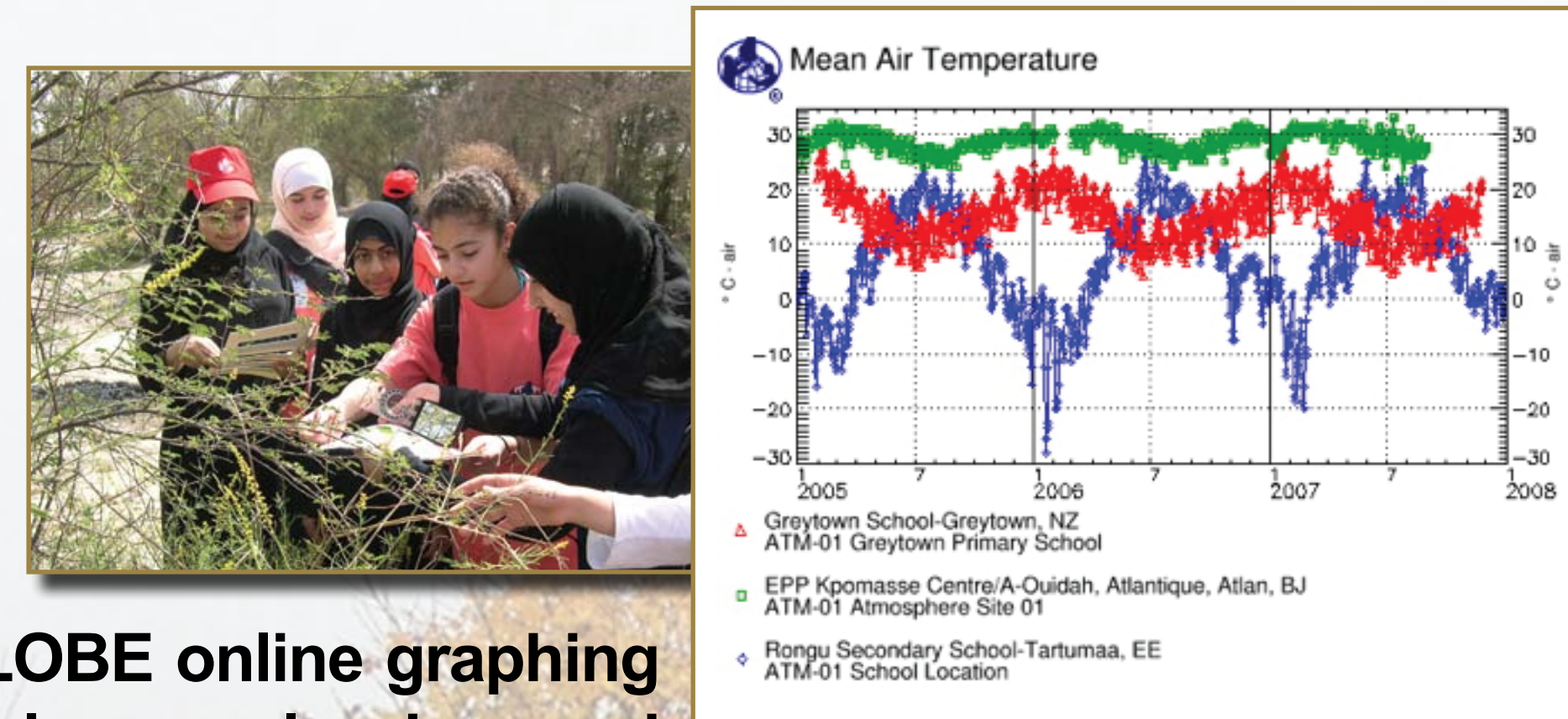


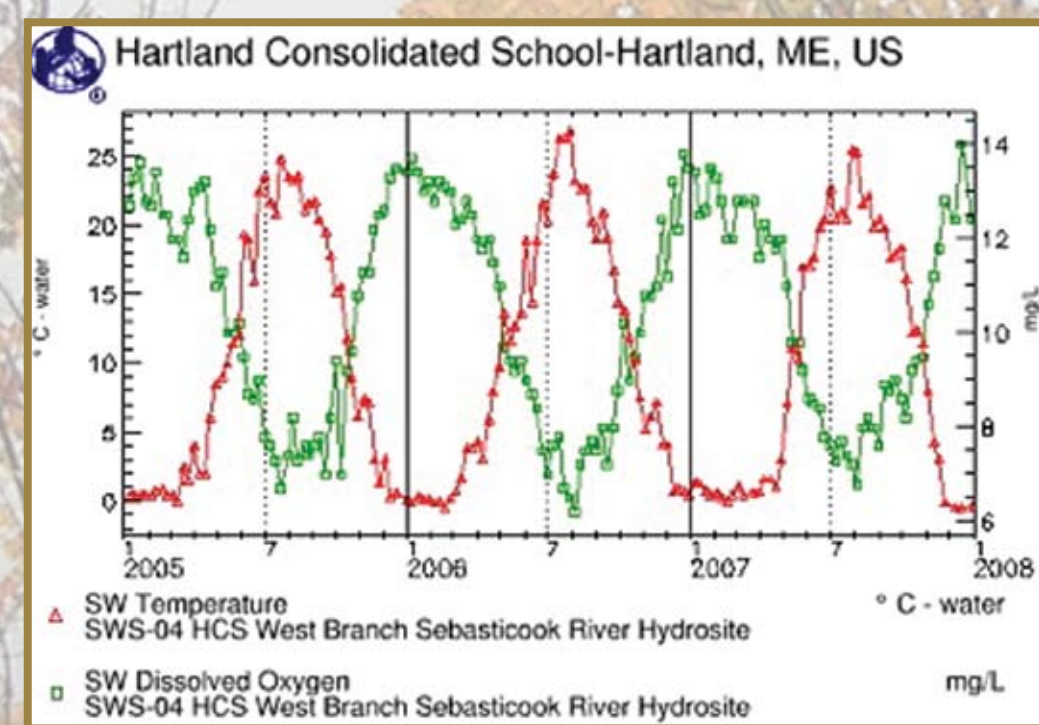
Figure 2. Scatter plot of air temperature and Latitude



Graph 1. Mean air temperature: New Zealand, Benin, Estonia

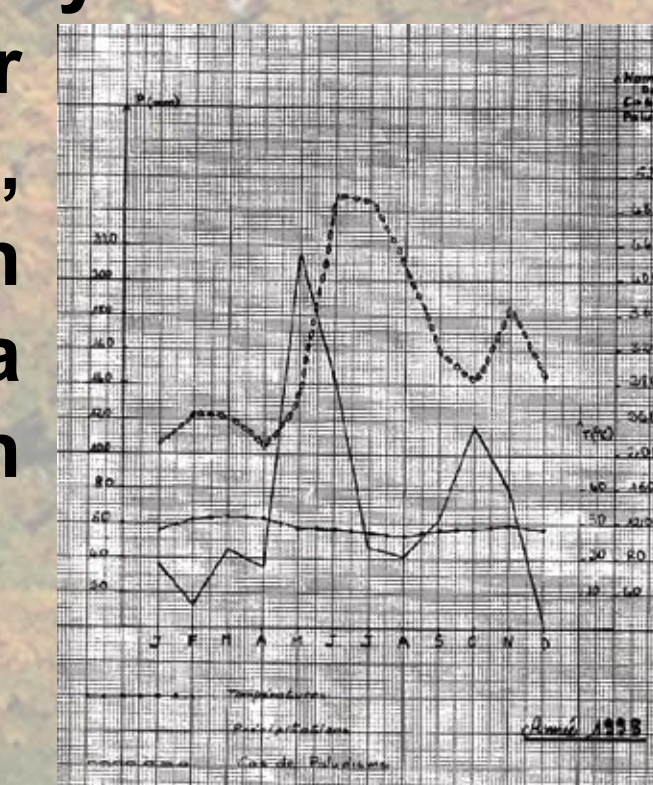
GLOBE online graphing tools can also be used

as tools to explain seasonal patterns and the Earth system processes that drive them, such as Graph 1 which shows mean air temperature in Northern and Southern hemispheres and near the Equator. Graphs can also show relationships between data and physical laws, such as Graph 2 which shows water temperature and dissolved Oxygen; this could then be used to teach about Henry's Law and the solubility of gases.



Graph 2. Water temperature and dissolved Oxygen

Ultimately, GLOBE students look beyond the data and begin asking questions about their local environment. For example, Graph 3, created by a school in Benin, shows how cases of malaria in the community correlates with temperature and precipitation.



Graph 3. Student graph - relationship between atmospheric data and malaria

NASA and NSF have identified 4 new Earth System Science Projects (ESSPs) to add to the suite of educational activities and resources GLOBE has offered to students and teachers since 1995.



These ESSPs build on the connection between data and visualizations by providing students access to new data and visualization tools, such as Carbon Cycle (See Figure 3) introducing systems modeling (using STELLA® software) and Watershed Dynamics (See Figure 4) incorporating hydrologic data into a geospatial environment through My World GIS™. Peer review and comparative data collection (local data compared with extreme deep-sea data) is provided by

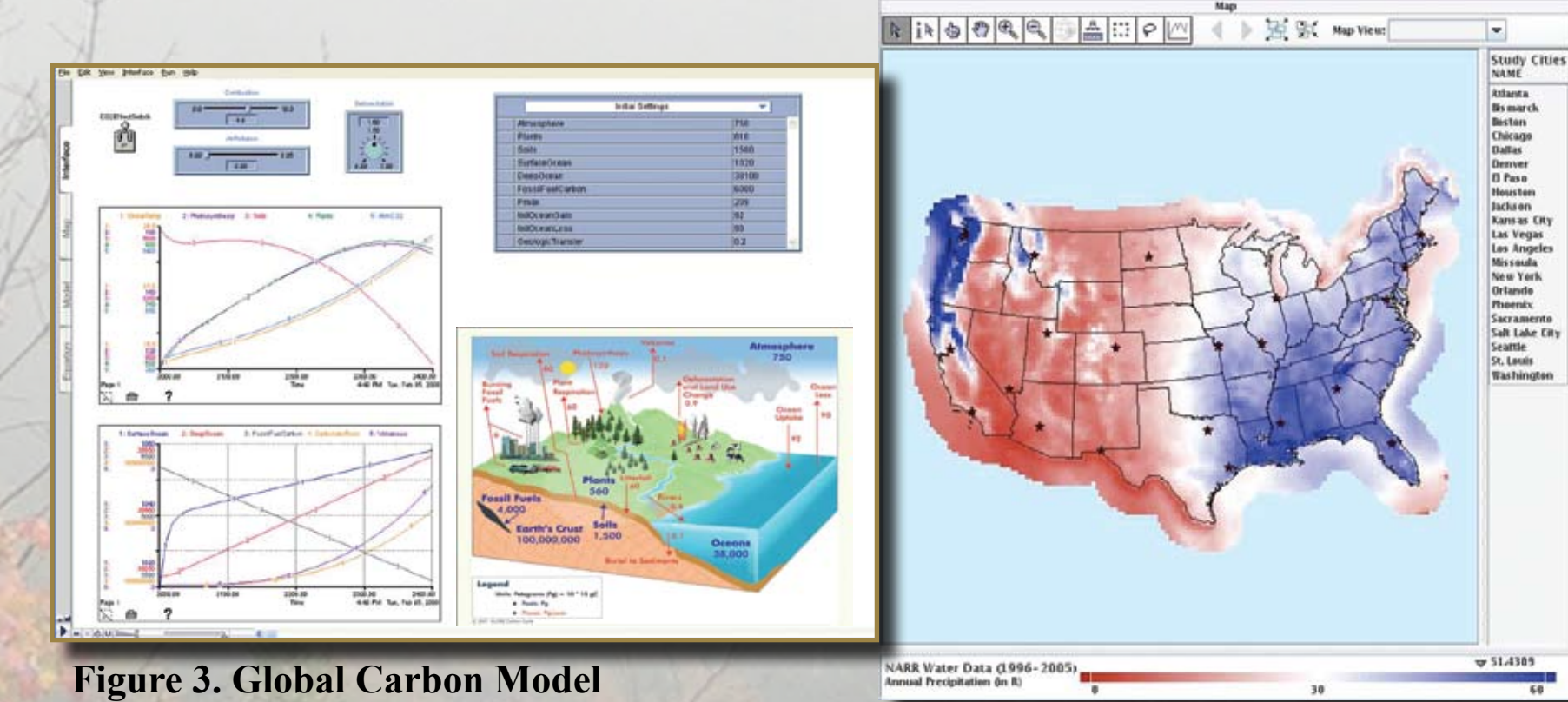


Figure 3. Global Carbon Model

Figure 4. My World GIS™

FLEXE while Seasons and Biomes uses new and established GLOBE phenology protocols in the validation of satellite data and provides a network of scientists to classrooms studying climate change issues.

GLOBE is an interagency program funded by NASA and NSF, supported by the U.S. Department of State, and implemented through a cooperative agreement between NASA, the University Corporation for Atmospheric Research (UCAR) in Boulder, Colorado, and Colorado State University in Fort Collins, Colorado.

“GLOBE is the quintessentially ideal program for involving kids in science.”
Nobel Laureate Dr. Leon Lederman



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