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Stalagmite memories of ancient rainfall

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STALAGMITE MEMORIES OF ANCIENT RAINFALL

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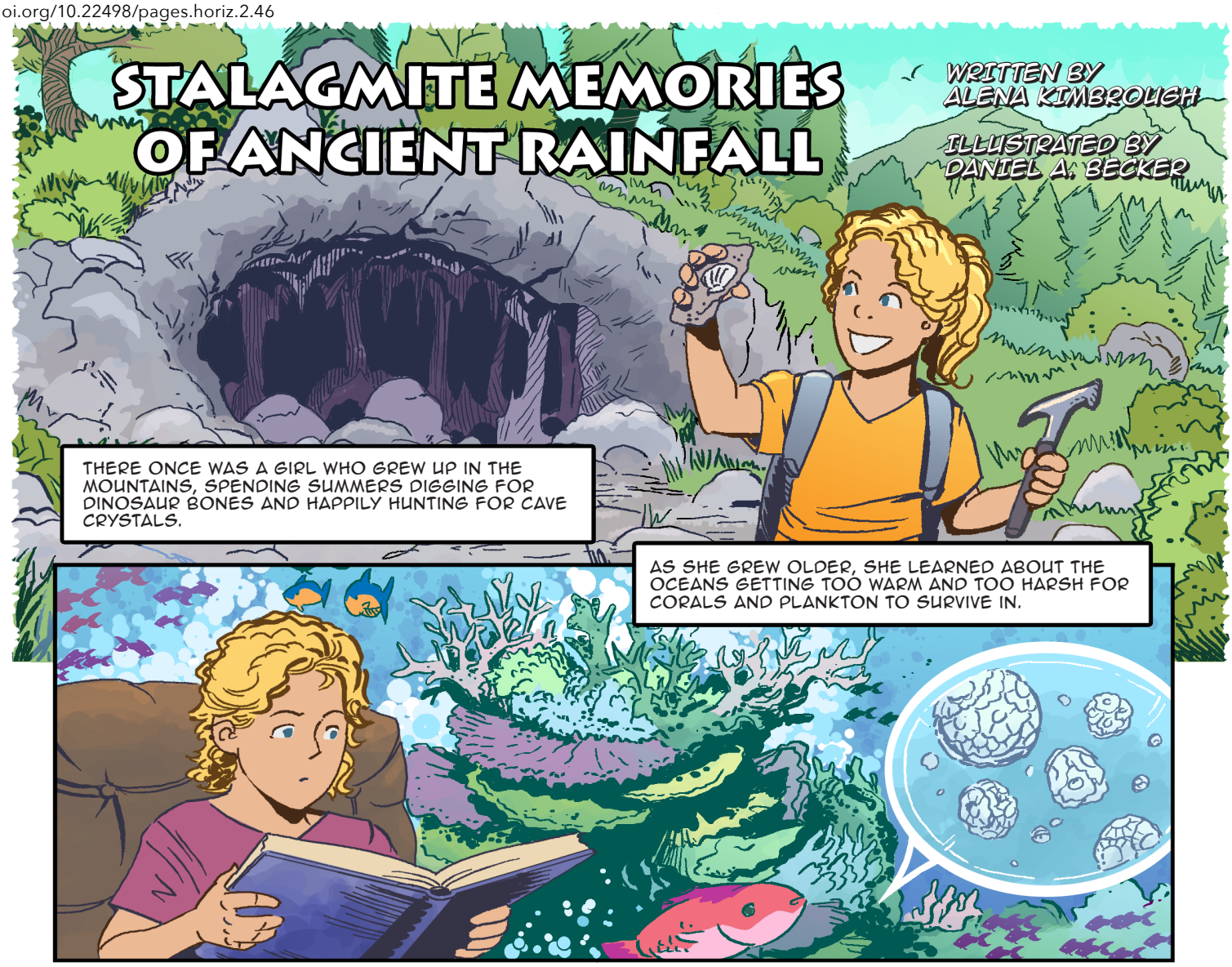
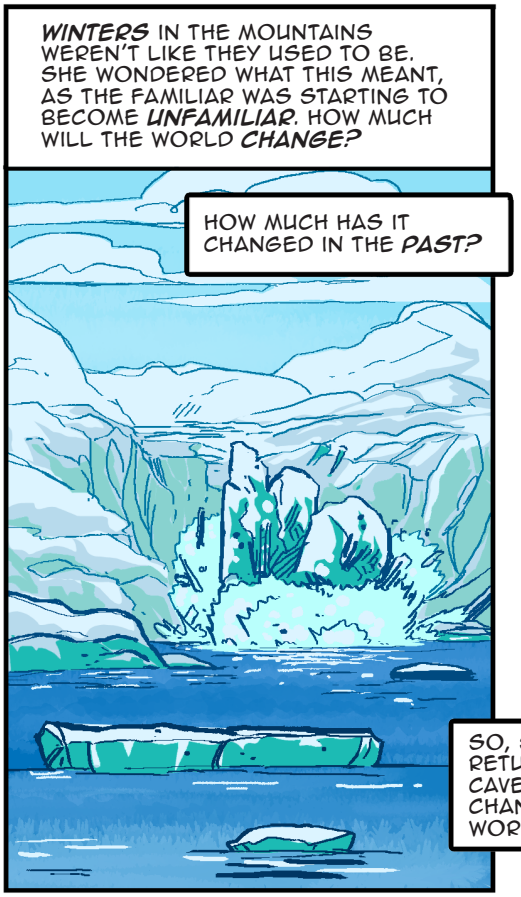
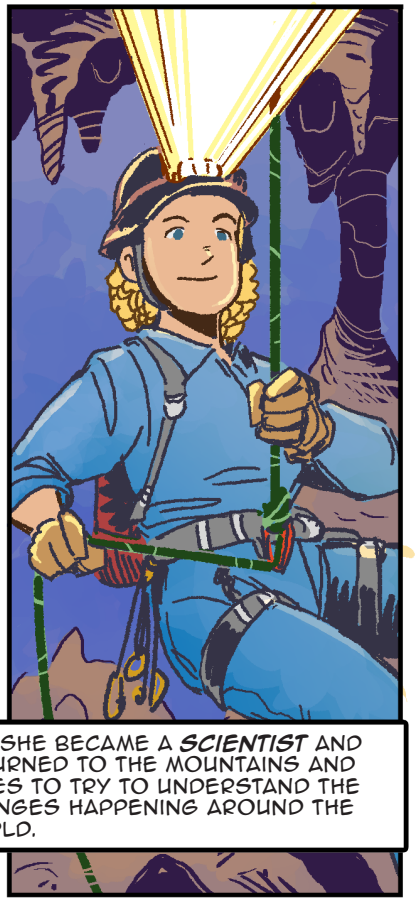
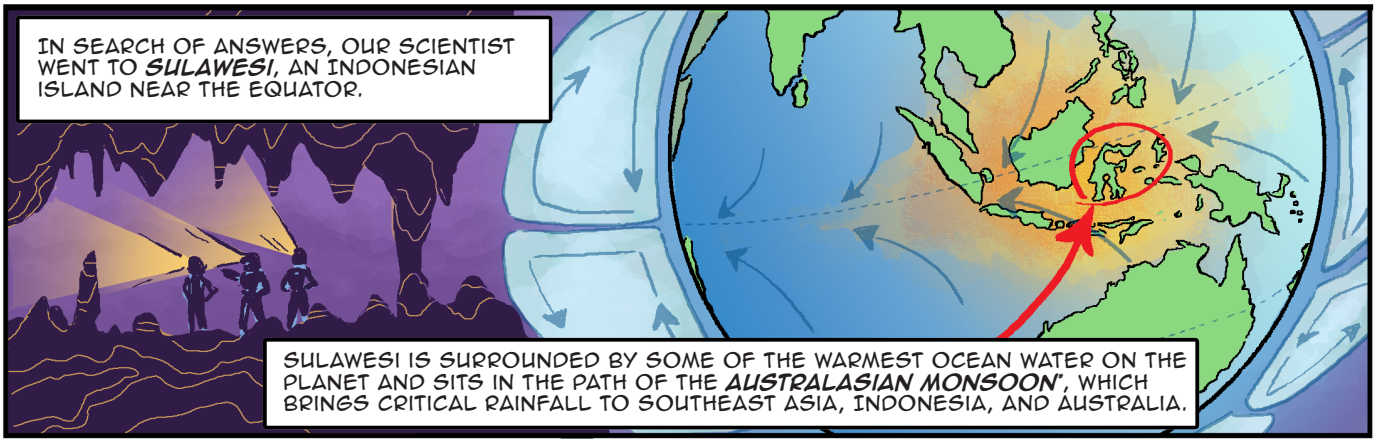


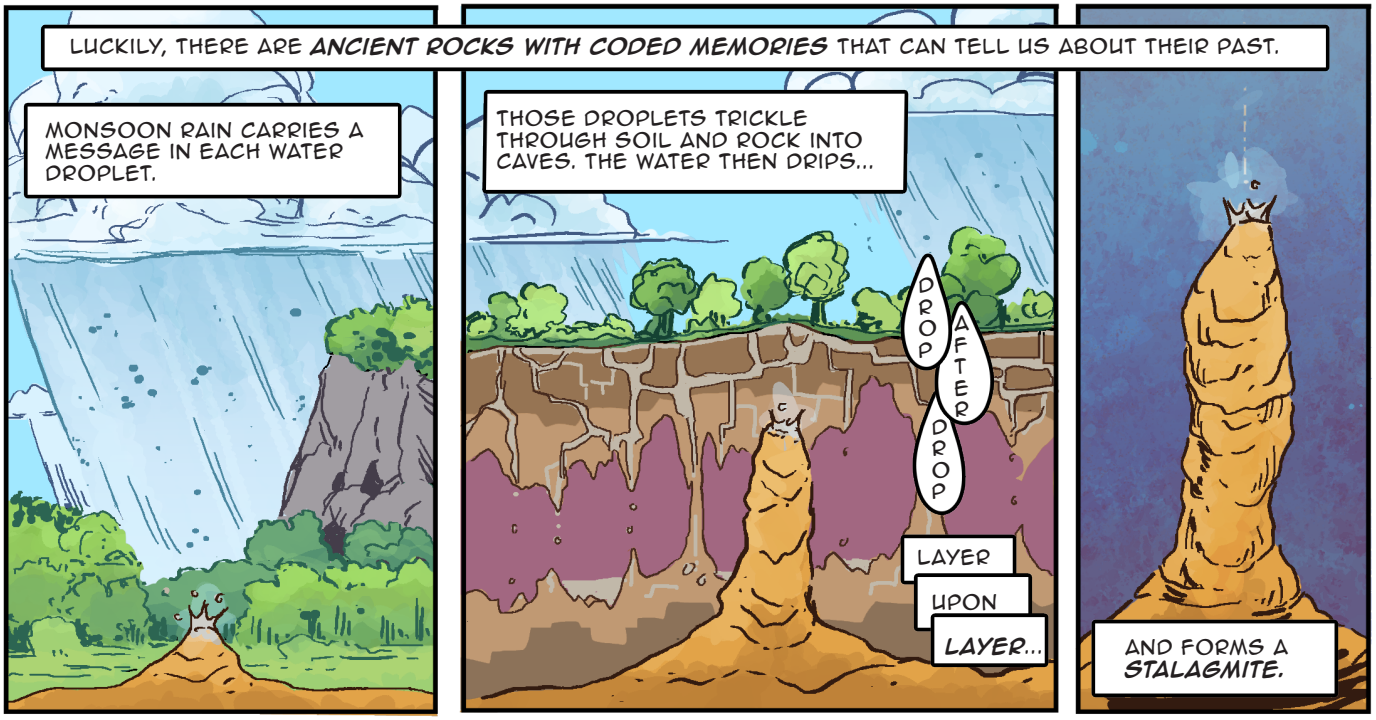


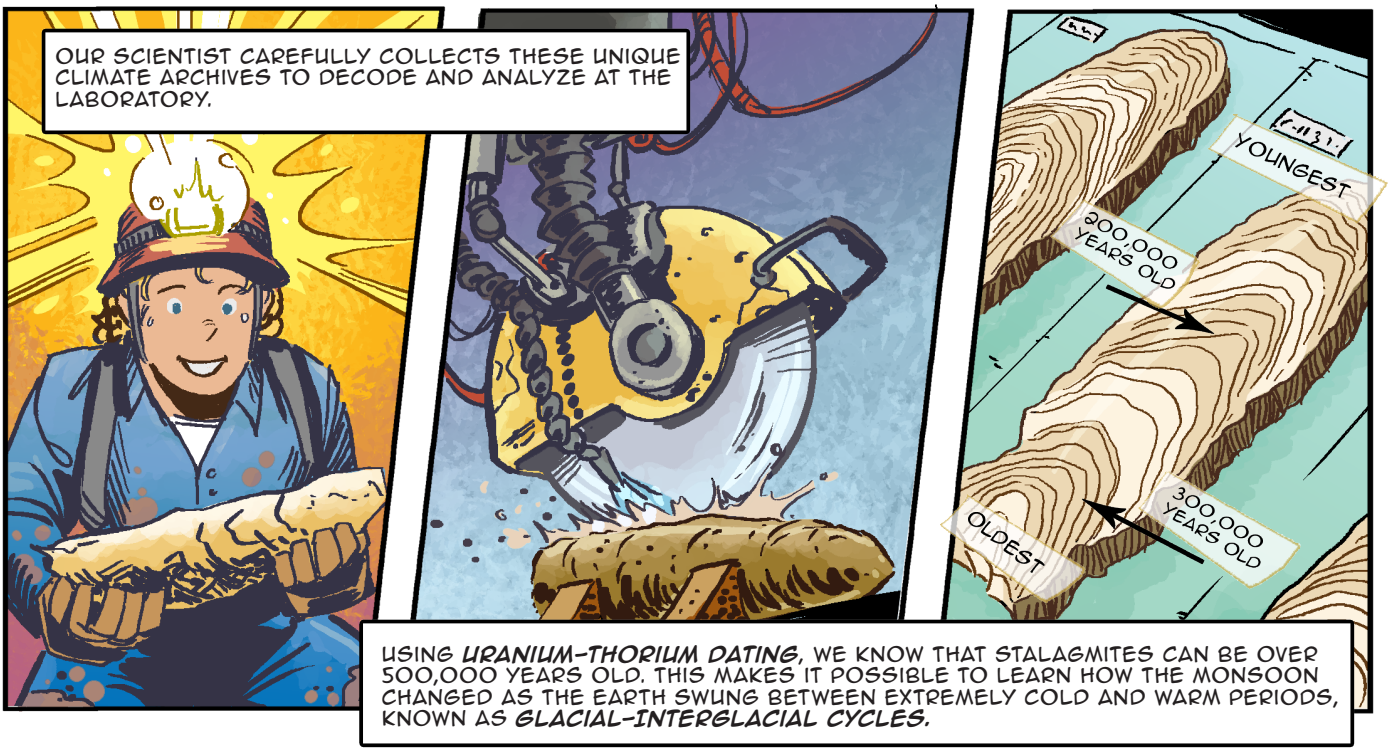




THE COLLISION OF WARM WATER, THE MONSOON, AND OTHER LARGE WEATHER SYSTEMS, PRODUCES HUGE AMOUNTS OF ENERGY AND **TRANSPORTS HEAT** AROUND THE EARTH.

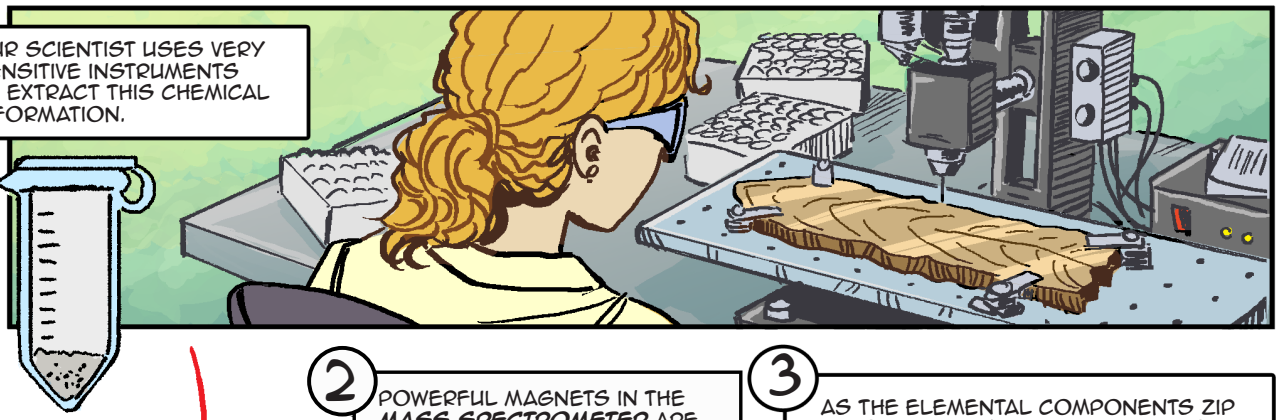
TO PREPARE FOR THE EFFECTS OF FUTURE CLIMATE CHANGE, OUR SCIENTIST WANTS TO LEARN WHAT THIS MONSOON WAS LIKE DURING **PAST WARM PERIODS.**





TO ISOLATE BRIEF SNAPSHOTS OF TIME, TINY SAMPLES ARE CAREFULLY DRILLED OUT ALONG THE CENTRAL LINE OF GROWTH. THESE FINE POWDERS CONTAIN A ***CHEMICAL IMPRINT*** OF THE WATER DROPLETS THAT FED THE STALAGMITE.

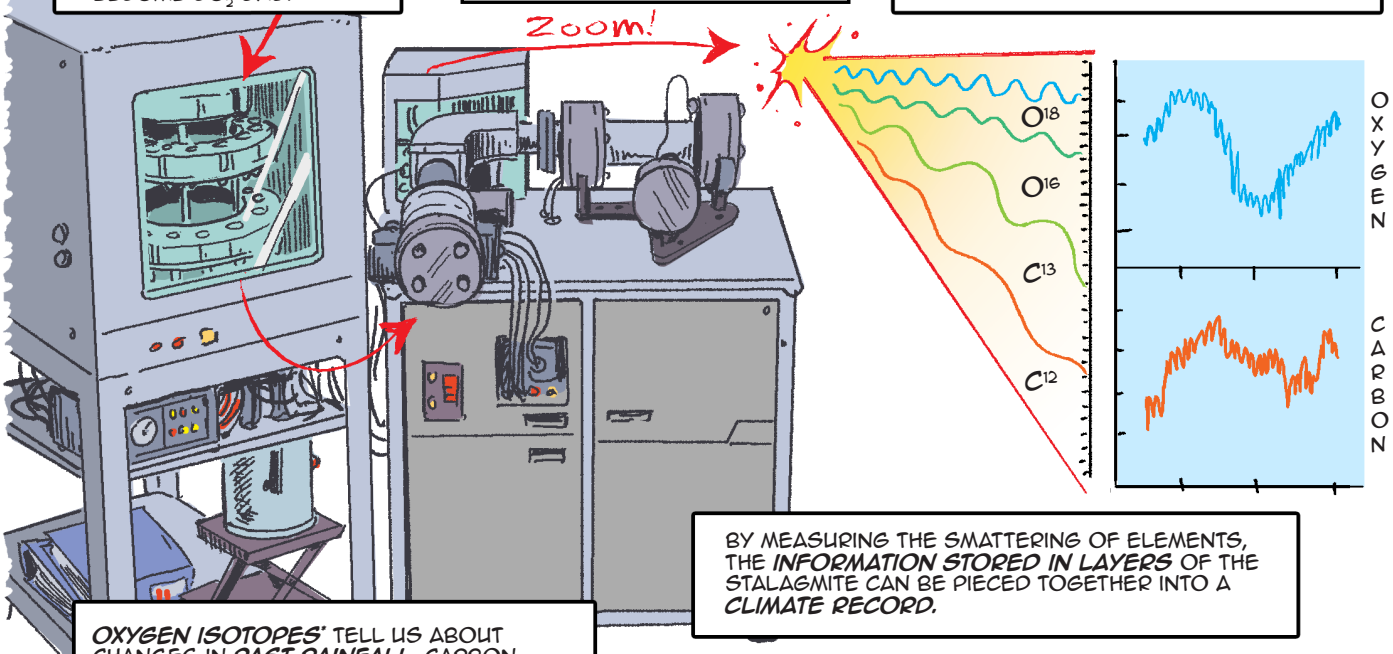
OUR SCIENTIST USES VERY SENSITIVE INSTRUMENTS TO EXTRACT THIS CHEMICAL INFORMATION.



1 THE STALAGMITE POWDERS ARE DISSOLVED IN PHOSPHORIC ACID AND BECOME CO_2 GAS.

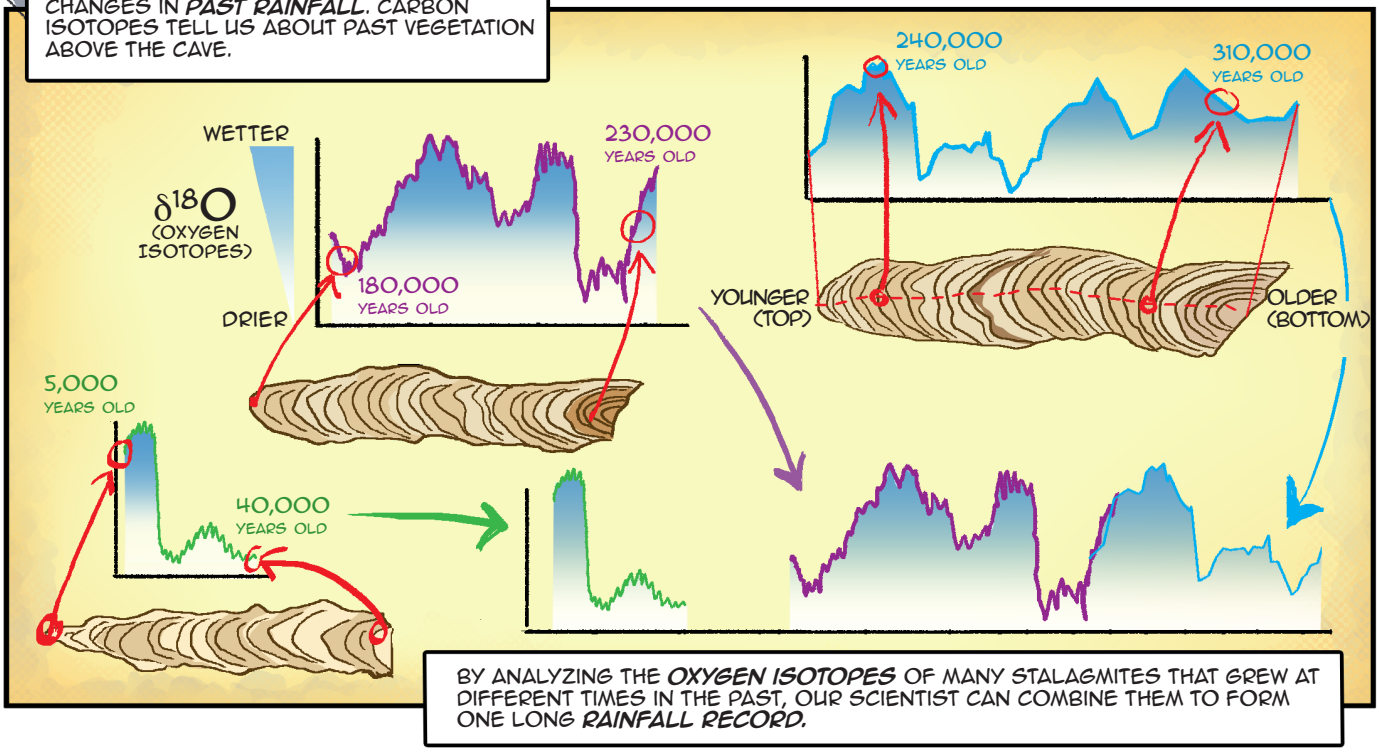
2 POWERFUL MAGNETS IN THE ***MASS SPECTROMETER*** ARE THEN USED TO ACCELERATE THE CO_2 GAS AROUND A CURVE, CAUSING THE MOLECULES TO SEPARATE INTO SMALLER PARTS.

3 AS THE ELEMENTAL COMPONENTS ZIP THROUGH THE MAGNET, THEY FAN OUT ACCORDING TO ***WEIGHT*** (NUMBER OF NEUTRONS) AND SLAM INTO A COLLECTION WALL AT THE OTHER END OF THE MASS SPECTROMETER.

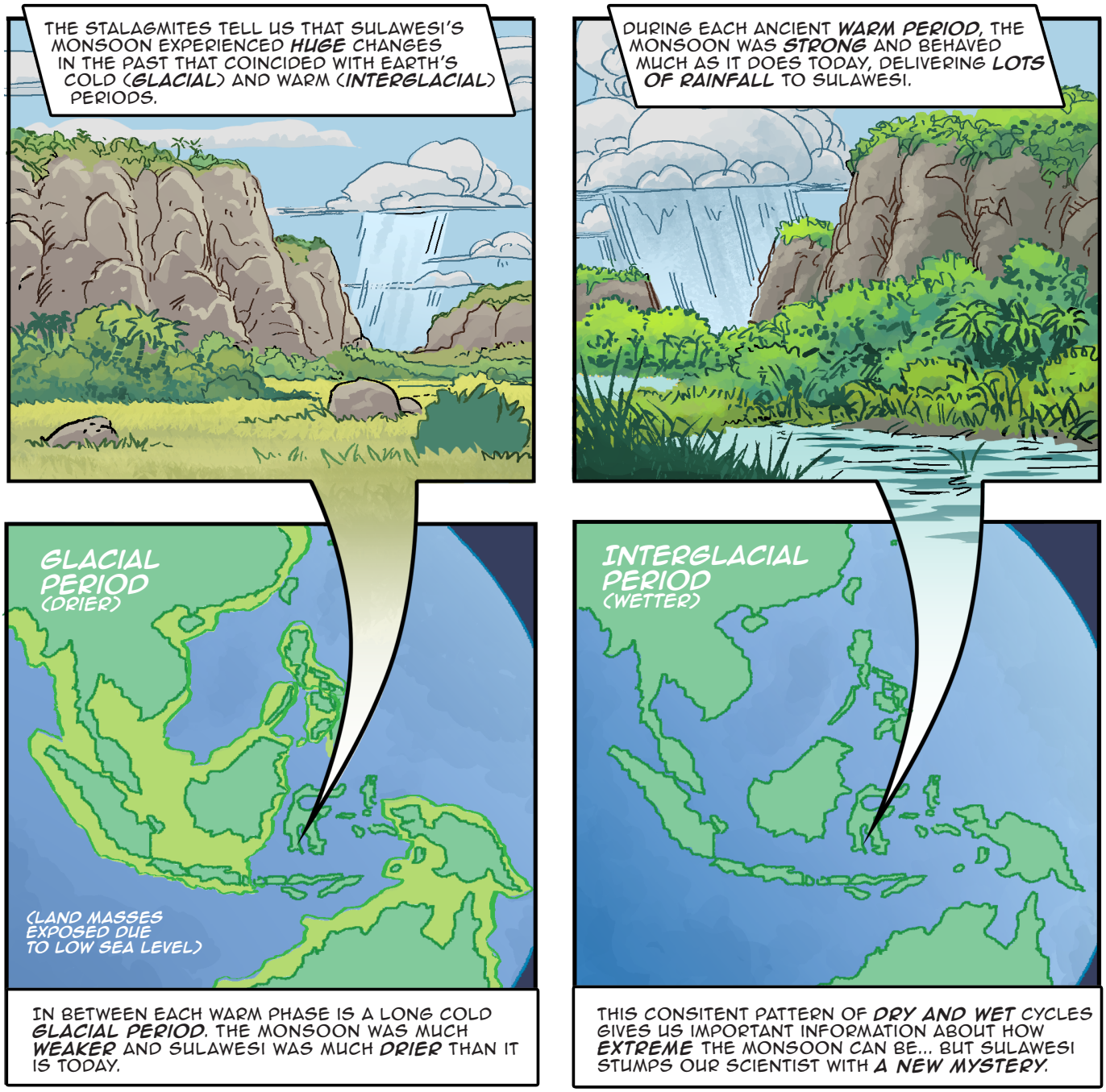


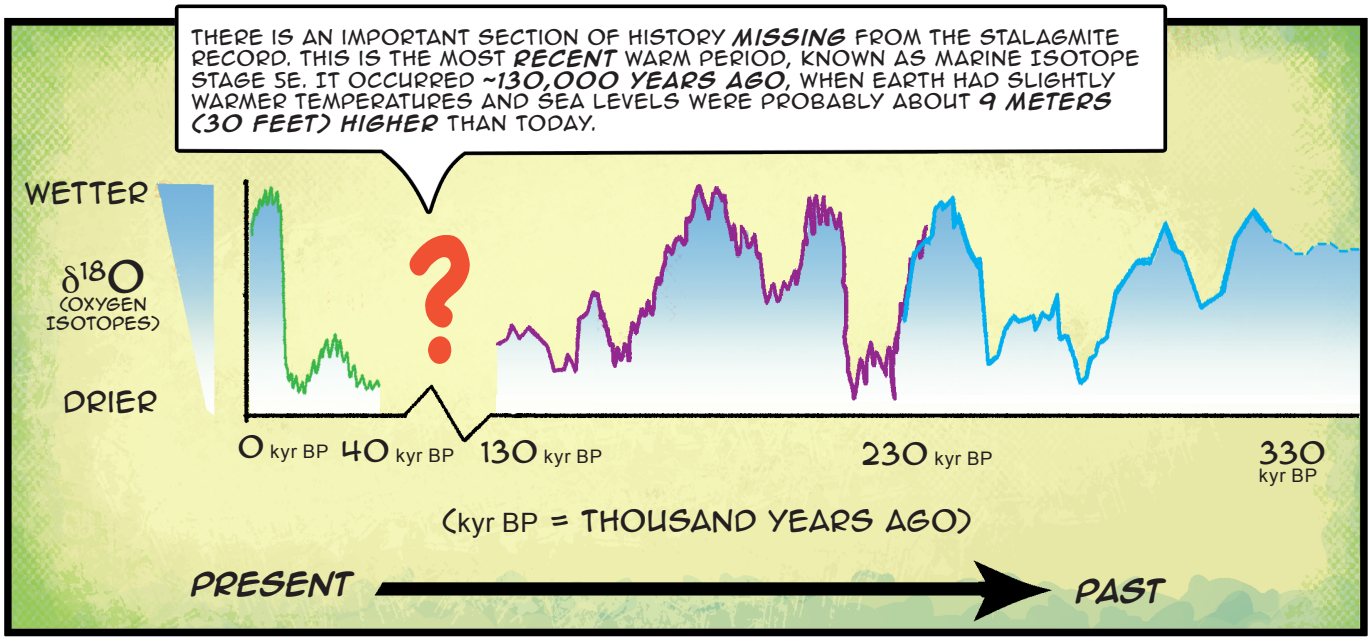
BY MEASURING THE SMATTERING OF ELEMENTS, THE ***INFORMATION STORED IN LAYERS*** OF THE STALAGMITE CAN BE PIECED TOGETHER INTO A ***CLIMATE RECORD.***

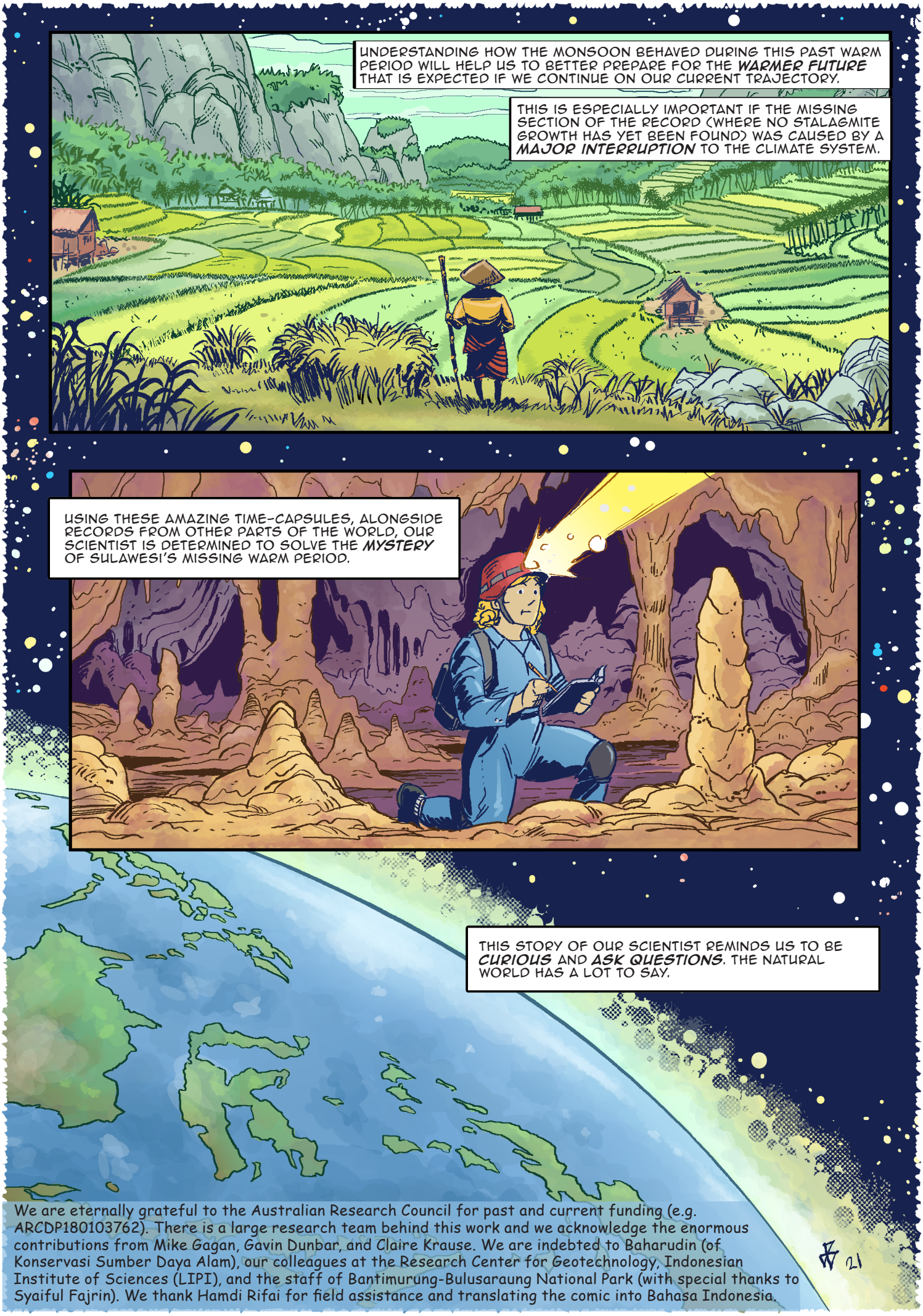
OXYGEN ISOTOPES TELL US ABOUT CHANGES IN ***PAST RAINFALL***. CARBON ISOTOPES TELL US ABOUT PAST VEGETATION ABOVE THE CAVE.



BY ANALYZING THE ***OXYGEN ISOTOPES*** OF MANY STALAGMITES THAT GREW AT DIFFERENT TIMES IN THE PAST, OUR SCIENTIST CAN COMBINE THEM TO FORM ONE LONG ***RAINFALL RECORD.***


THE STALAGMITES TELL US THAT SULAWESI'S MONSOON EXPERIENCED HUGE CHANGES IN THE PAST THAT COINCIDED WITH EARTH'S COLD (GLACIAL) AND WARM (INTERGLACIAL) PERIODS.
DURING EACH ANCIENT WARM PERIOD, THE MONSOON WAS STRONG AND BEHAVED MUCH AS IT DOES TODAY, DELIVERING LOTS OF RAINFALL TO SULAWESI.
GLACIAL PERIOD (DRIER)
(LAND MASSES EXPOSED DUE TO LOW SEA LEVEL)
INTERGLACIAL PERIOD (WETTER)
IN BETWEEN EACH WARM PHASE IS A LONG COLD GLACIAL PERIOD. THE MONSOON WAS MUCH WEAKER AND SULAWESI WAS MUCH DRIER THAN IT IS TODAY.
THIS CONSITENT PATTERN OF DRY AND WET CYCLES GIVES US IMPORTANT INFORMATION ABOUT HOW EXTREME THE MONSOON CAN BE... BUT SULAWESI STUMPS OUR SCIENTIST WITH A NEW MYSTERY.


THERE IS AN IMPORTANT SECTION OF HISTORY MISSING FROM THE STALAGMITE RECORD. THIS IS THE MOST RECENT WARM PERIOD, KNOWN AS MARINE ISOTOPE STAGE 5E. IT OCCURRED ~130,000 YEARS AGO, WHEN EARTH HAD SLIGHTLY WARMER TEMPERATURES AND SEA LEVELS WERE PROBABLY ABOUT 9 METERS (30 FEET) HIGHER THAN TODAY.
WETTER
δ18O (OXYGEN ISOTOPES)
DRIER
?
0 kyr BP
40 kyr BP
130 kyr BP
230 kyr BP
330 kyr BP
(kyr BP = THOUSAND YEARS AGO)
PRESENT
PAST



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