



MESA WATER SPOTTERS

Water Spotters

Water Cycle Journey

<http://cires.colorado.edu/education/outreach/waterspotters/>

GIFT Workshop Goals

- Give overview of Lesson Suite Resources
- Experience two activities
- Preview Elementary Curriculum

Preparing Citizen Scientists



Image: Young voices on climate change



An Educator's Guide

Water Spotters

Rain, Weather and Change
A curriculum to explore Colorado's water cycle and weather.

INSIDE

- Essential Questions
- Strategies for Teaching
- Engaging Activities
- Activities to Extend Learning
- Correlation to Standards

CIRES Education & Outreach
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Preparing Citizen Scientists

Module 1: Water Cycle Foundation

Diorama

Water Spotters protocol

(Build a precipitation Collector)

Module 2: Watersheds and Water Budget

Local watershed

School yard water budget

Module 3: Tracking Weather

Track weather in different location

Factors that Influence Temperature

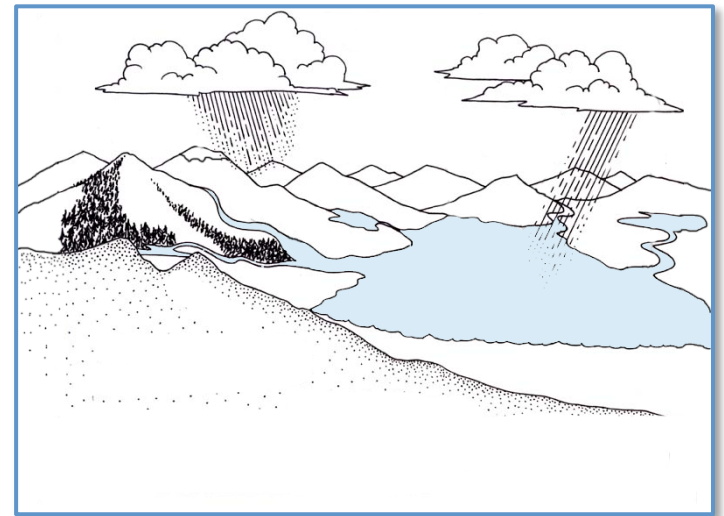
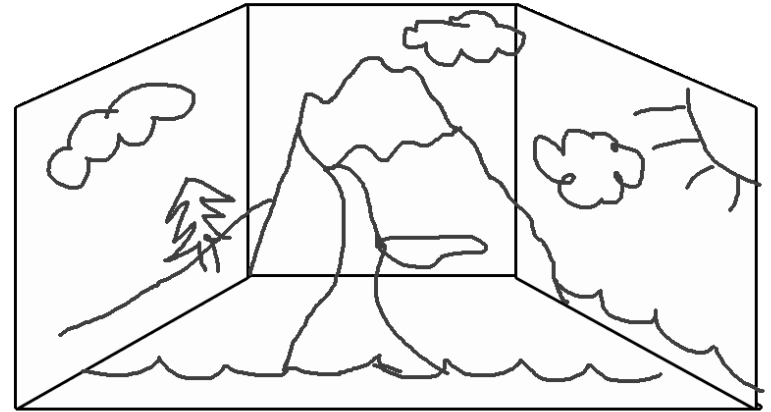
Module 4: Water Chemistry

Atoms, Elements and Isotopes

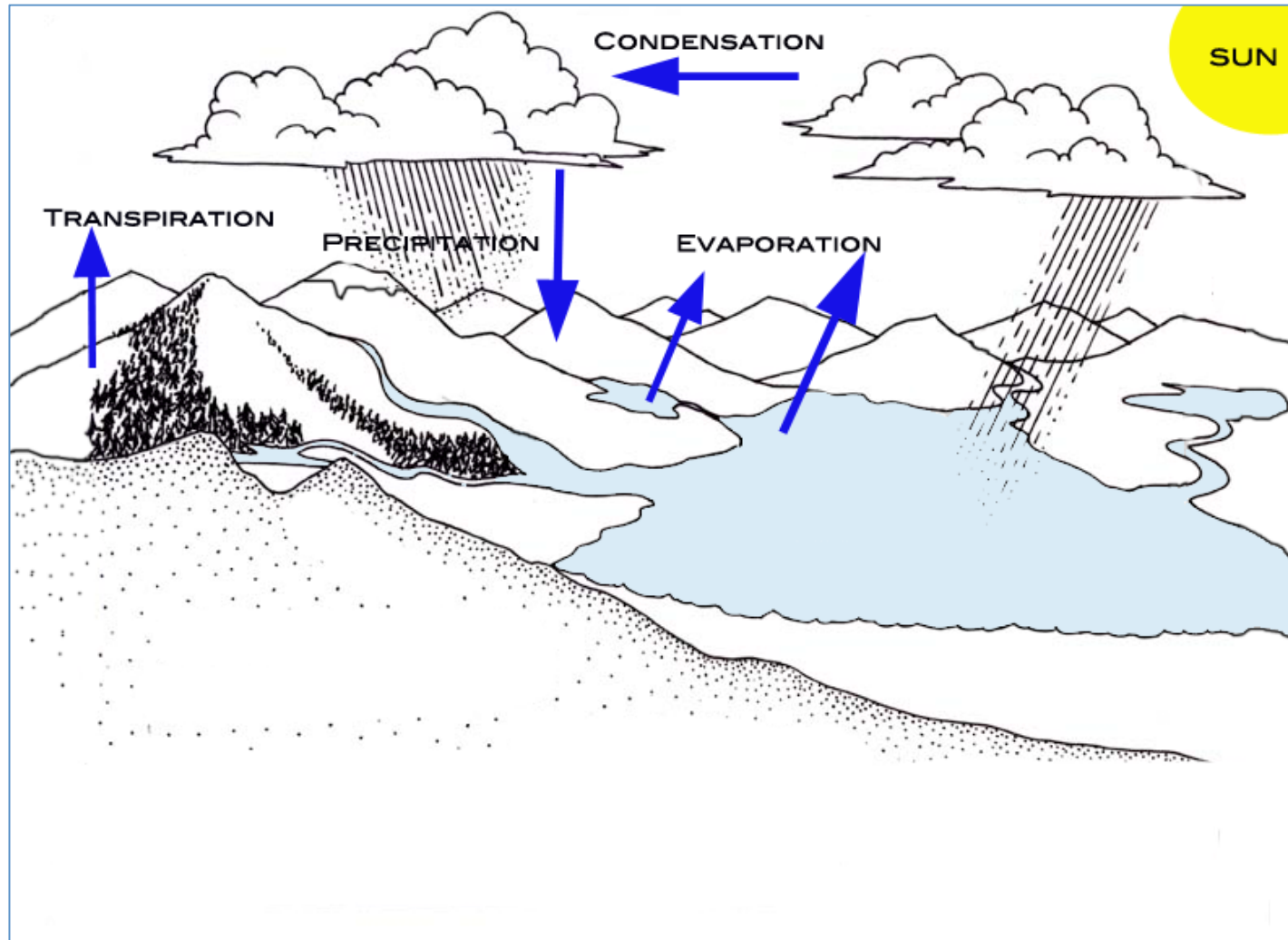
Water Isotope Journey



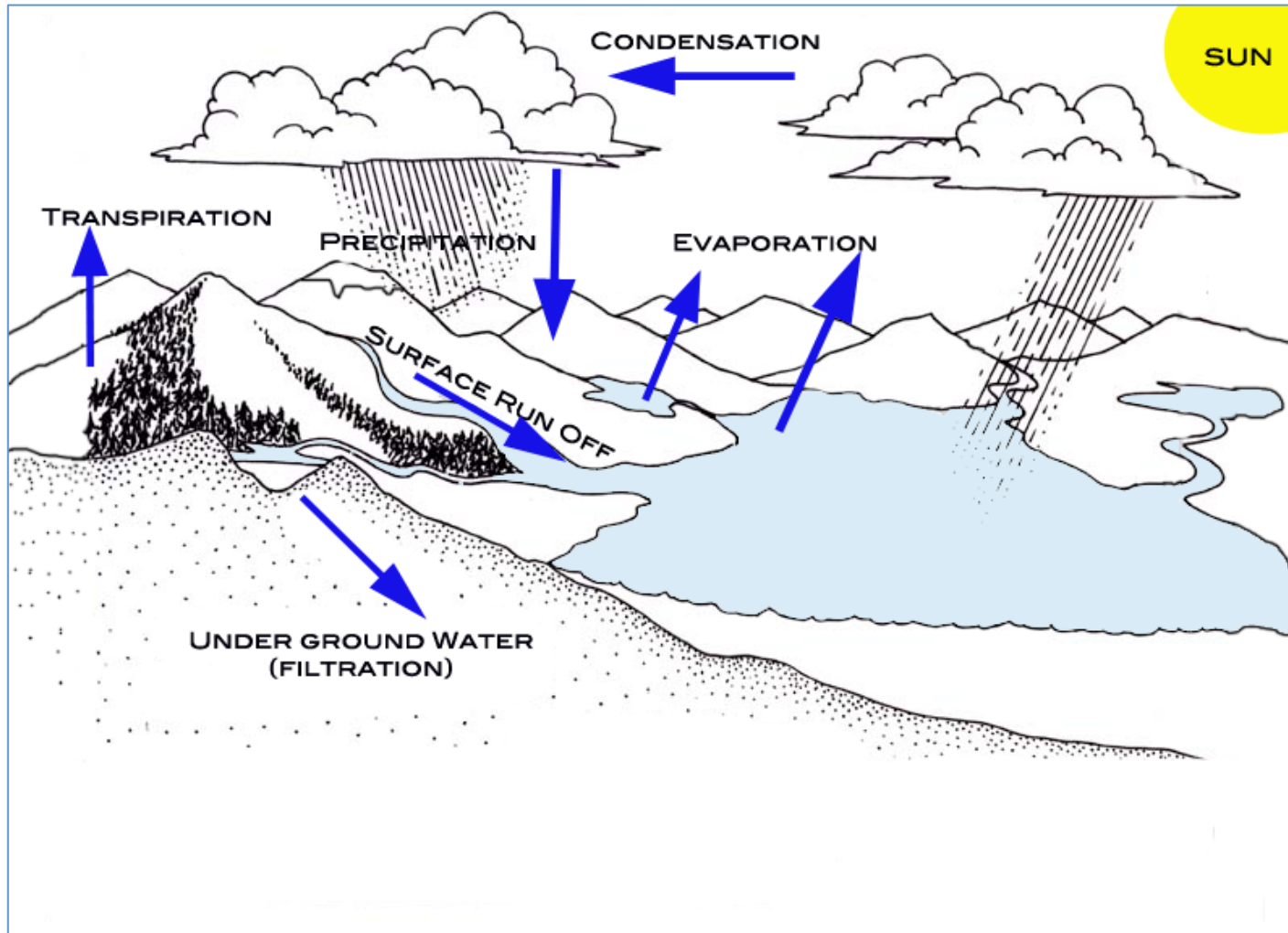
Water Cycle Journey



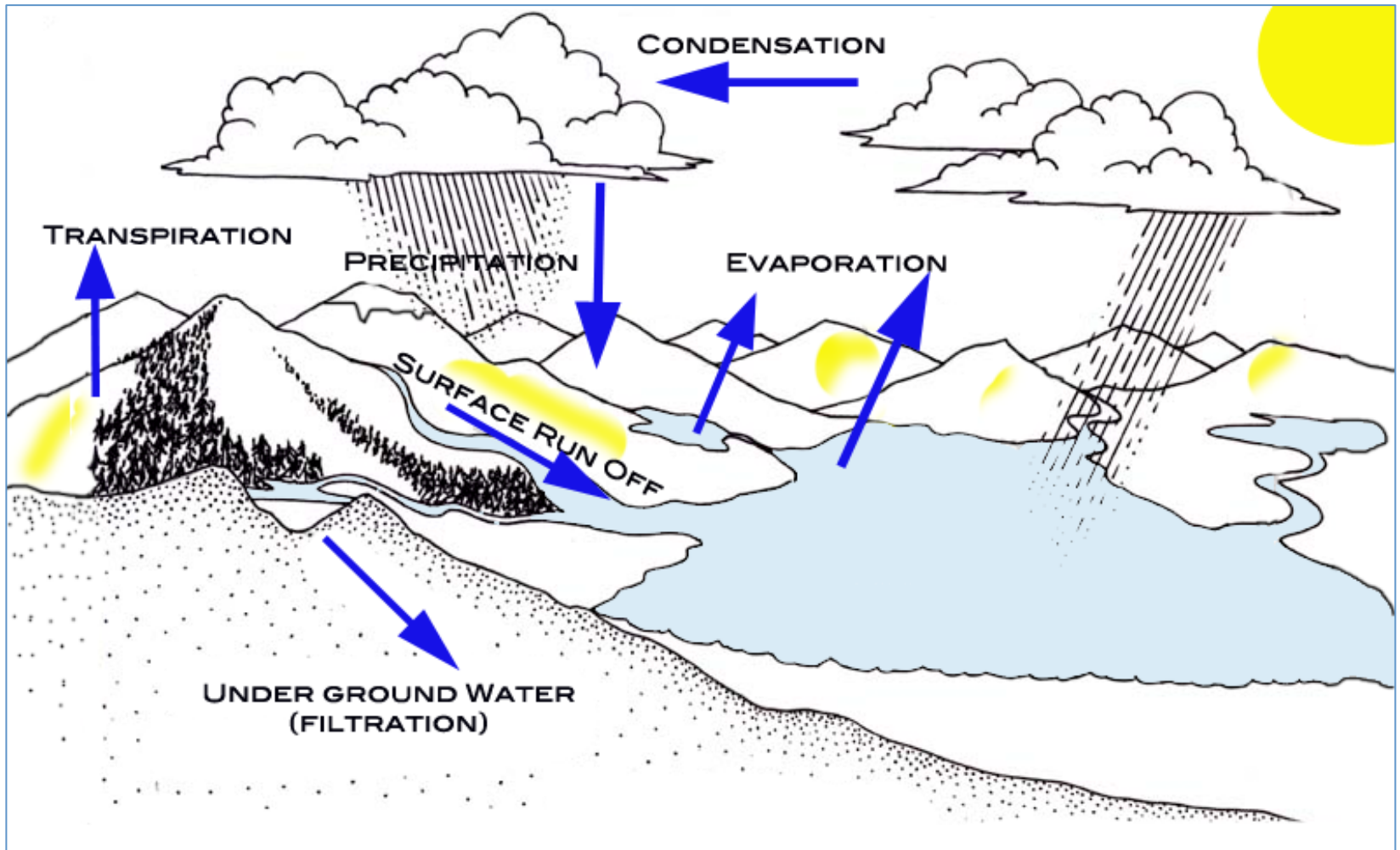
Water Cycle Probing



Water Cycle Probing



Water Cycle



Water Cycle Journey



Water Cycle Journey



Ocean



Atmosphere



Soil / Surface



Plant



Groundwater



Ice / Glacier

Water Cycle Processes Worksheet

Name _____ Date _____

Instructions: You are a water molecule about to embark on a water cycle journey. Write the name of the reservoir you start in on line #1. You will move from reservoir to reservoir by rolling dice. Record each reservoir you visit **every time** you roll the dice, even if you are instructed to stay at the same reservoir for repeated rolls. Continue to roll until you have filled in the left column of your worksheet. After you have completed your water cycle journey, your teacher will ask you to fill in the right column of your worksheet by naming the processes by which you moved from one reservoir to another. An example is shown below.

Example

Reservoir	Process
1. <u>ocean</u>	A. <u>start</u>
2. <u>ocean</u>	B. <u>storage</u>
3. <u>atmosphere</u>	C. <u>evaporation</u>
4. <u>glacier</u>	D. <u>precipitation (snow)</u>

Your Journey

Reservoir	Process
1. _____	A. <u>start</u>
2. _____	B. _____
3. _____	C. _____
4. _____	D. _____
5. _____	E. _____
6. _____	F. _____


Residence Times

1. Did you travel to all six of the reservoirs?
2. Rank the six reservoirs according to the longest amount of time you spent in each one.
3. At which reservoir was your longest stay
4. At which reservoir was your shortest stay?

Here are typical residence times of water on planet Earth:

<u>Reservoir</u>	<u>Average Residence Time</u>
Ocean	~3,000 years
Groundwater	100s to 1000s of years (depending on depth)
Ice/Glacier	10s of years
Soil/Surface	months (soil, rivers); 10s of years (lakes)
Plant (biomass)	weeks
Atmosphere	days

5. Was your journey typical of an average water molecule? Make an argument for or against.


Student Guide

Residence Times Worksheet

Name _____ Date _____


Instructions: You have just completed your journey through the water cycle. Calculate your longest stay in each reservoir. An easy way to do this is to count the longest chain of any one color of beads on your water cycle bracelet. You can also look at your Water Cycle Processes Worksheet and count the number of **consecutive** times you visited each reservoir. For example, if you visited ocean, ocean, ocean, atmosphere, ocean, and then ocean, your longest stay in ocean is 3 and your longest stay in atmosphere is 1.

Longest Stay

Ocean _____	Soil/Surface _____
Atmosphere _____	Plant _____
Ice/Glacier _____	Groundwater _____


Questions

1. Did you travel to all six of the reservoirs?
2. Rank the six reservoirs according to the longest amount of time you spent in each one.
3. At which reservoir was your longest stay?
4. At which reservoir was your shortest stay?





Heavy and Light Water


Student Guide

Heavy Water Worksheet

Name _____ Date _____

Instructions: You are a heavy water molecule (HDO or H₂¹⁸O) about to cycle amongst the ocean (liquid), the atmosphere (vapor), and clouds (liquid). You will evaporate, condense, re-evaporate, or precipitate as you move from one reservoir to another. Your journey will be determined by rolling a die with your partner and following the directions below. Your goal is to keep track of your journey by drawing arrows and circling reservoirs. See the other side of the worksheet for an example.


Rolling Directions (only one person should roll)

If you roll...	If you are at OCEAN...	If you are at AIR...	If you are at CLOUD...
1	Draw an arrow ocean → air	Draw an arrow air → cloud	Draw an arrow cloud → ocean
2	Draw an arrow ocean → air	Draw an arrow air → cloud	Draw an arrow cloud → ocean
3	Draw an arrow ocean → air	Draw an arrow air → cloud	Draw an arrow cloud → ocean
4	Circle ocean	Draw an arrow air → cloud	Draw an arrow cloud → ocean
5	Circle ocean	Draw an arrow air → cloud	Draw an arrow cloud → ocean
6	Circle ocean	Circle air	Draw an arrow air ← cloud

Your Journey
Start in the ocean!

Air
Cloud

Ocean


Student Guide

Light Water Worksheet

Name _____ Date _____

Instructions: You are a light water molecule (H₂O) about to cycle amongst the ocean (liquid), the atmosphere (vapor), and clouds (liquid). You will evaporate, condense, re-evaporate, or precipitate as you move from one reservoir to another. Your journey will be determined by rolling a die with your partner and following the directions below. Your goal is to keep track of your journey by drawing arrows and circling reservoirs. See the other side of the worksheet for an example.

Rolling Directions (only one person should roll)

If you roll...	If you are at OCEAN...	If you are at AIR...	If you are at CLOUD...
1	Draw an arrow ocean → air	Draw an arrow air → cloud	Draw an arrow cloud → ocean
2	Draw an arrow ocean → air	Draw an arrow air → cloud	Draw an arrow cloud → ocean
3	Draw an arrow ocean → air	Draw an arrow air → cloud	Draw an arrow cloud → ocean
4	Draw an arrow ocean → air	Circle air	Draw an arrow air ← cloud
5	Draw an arrow ocean → air	Circle air	Draw an arrow air ← cloud
6	Circle ocean	Circle air	Draw an arrow air ← cloud

Your Journey
Start in the ocean!

Air
Cloud

Ocean



Heavy and Light Water

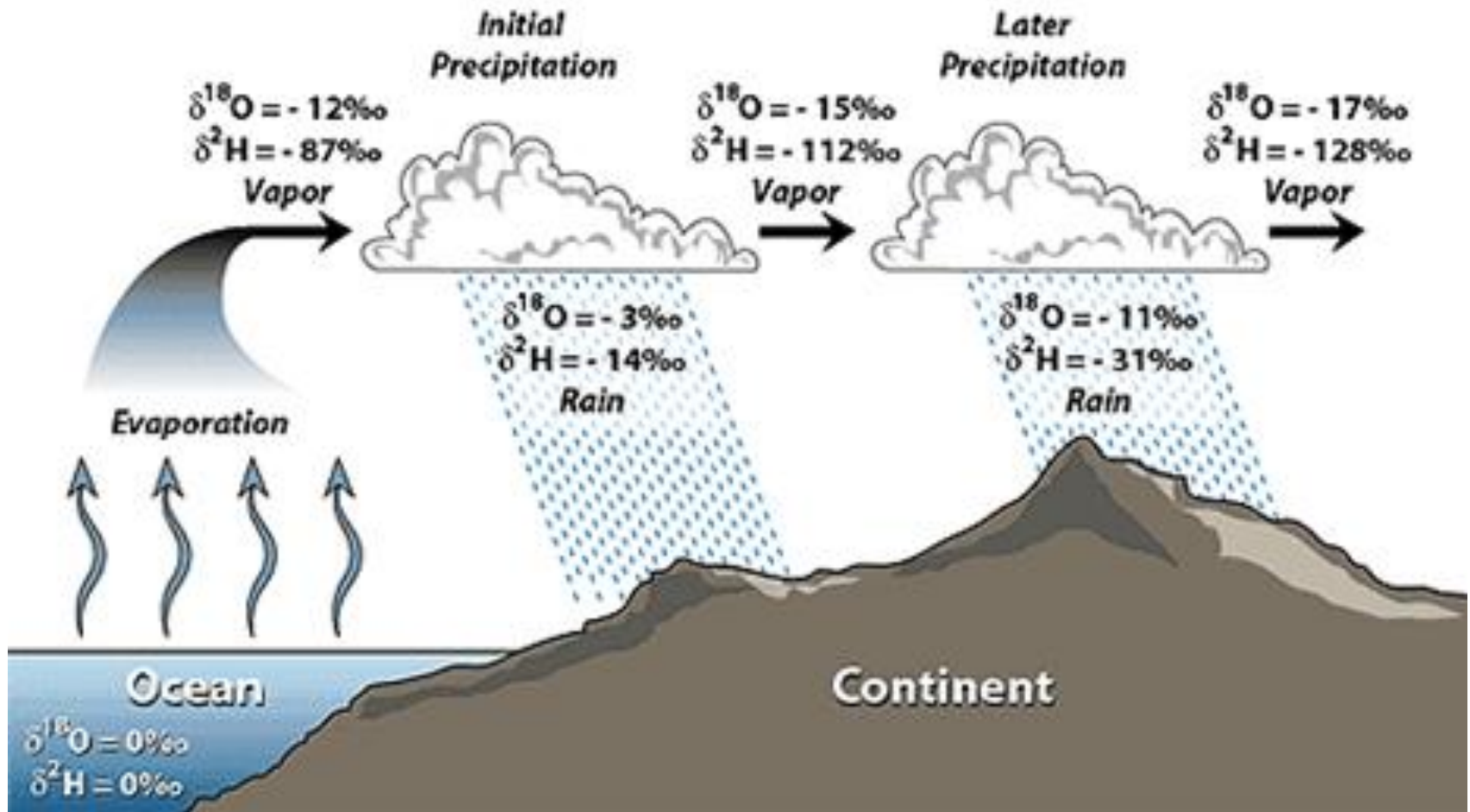
Air

Cloud

Ocean

If you roll...	If you are at OCEAN...	If you are at AIR...	If you are at CLOUD...
1	Draw an arrow ocean→air	Draw an arrow air→cloud	Draw an arrow cloud→ocean
2	Draw an arrow ocean→air	Draw an arrow air→cloud	Draw an arrow cloud→ocean
3	Draw an arrow ocean→air	Draw an arrow air→cloud	Draw an arrow cloud→ocean
4	Draw an arrow ocean→air	Circle air	Draw an arrow air←cloud
5	Draw an arrow ocean→air	Circle air	Draw an arrow air←cloud
6	Circle ocean	Circle air	Draw an arrow air←cloud

Water Cycle Journey with Isotopes



Education Outreach Program

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K-12 Projects

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Water Spotters in the MESA Classroom:

Rain, weather, and change

The Water Spotters Middle school lesson suite was developed by teachers and scientists. It includes new lessons that have been developed in coordination with science teachers that emphasize both core scientific standards and application learning about the water cycle. The modules include original lessons and lessons with expanded original material to teach about water and water isotopes.

The Water Spotters program uses video to teach collection protocols and give background on the project. Weather station data from schools are disseminated online alongside the rainwater collection protocols.



Dr. David Noone's Water Spotters Program

from CIRES Education & Outreach



Water Spotter Links:

- [Water Spotters Project Home](#)
- [Water Spotters Elementary Guide](#)
- [Water Spotters Weather Station](#)

More Information:

Please contact Emily Kellagher at [emily.kellagher AT colorado DOT edu](mailto:emily.kellagher@colorado.gov)

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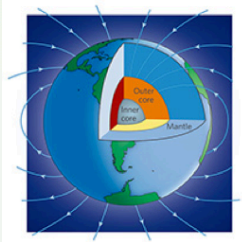
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K-12 Projects: Classroom Resources



MESA Water Spotters

Water Spotters is a network of students who observe rain, snow, and weather along Colorado's northern Front Range. The Water Spotters program has middle school and elementary lessons developed by teachers and scientists. The modules include original lessons and lessons that expand on basic lessons about the water cycle to teach about water and water isotopes.



Geomagnetism in the MESA Classroom: An Essential Science for Modern Society:

Geomagnetism in the MESA Classroom is a four-part after-school module sponsored by NASA that allows students to explore geomagnetism. Students will use compasses, perform navigation exercises, complete a caching activity, and attend a field trip to NOAA's David Skaggs Research Center in Boulder.



- Emily Kellagher
- CIRES Education Outreach
- Emily.Kellagher@Colorado.edu

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