

# Dual rate soil moisture recording with DeltaLINK

Version 2: Linked to DeltaLINK version 2.3

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## Introduction

Standard GP1 and DL6 programs in DeltaLINK provide a *dual rate soil moisture recording* feature.

Originally it was intended just for recording the progress of wetting fronts through the soil in response to rainfall events.

From DeltaLINK version 2.3 dual rate logging may be activated in two ways

Option 1) via either of the counter channels -see page 2.

Option 2) via the relay control - see page 5.

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***Only soil moisture can be read and logged at the faster rate***

***At least one soil moisture sensor must be connected***

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## Option 1: Dual Rate Logging enabled via counter channels e.g. rainfall rate

Soil moisture conditions generally change quite slowly and can be monitored hourly. However, after rainfall, soil moisture conditions can change rapidly and it can be beneficial to record a wetting front as it passes through the soil in order to understand the soil dynamics.

When dual rate recording is enabled, the program monitors rainfall (say).

If the rainfall rate exceeds a *trigger* level,

....the program starts recording soil moisture at an *accelerated recording rate*.

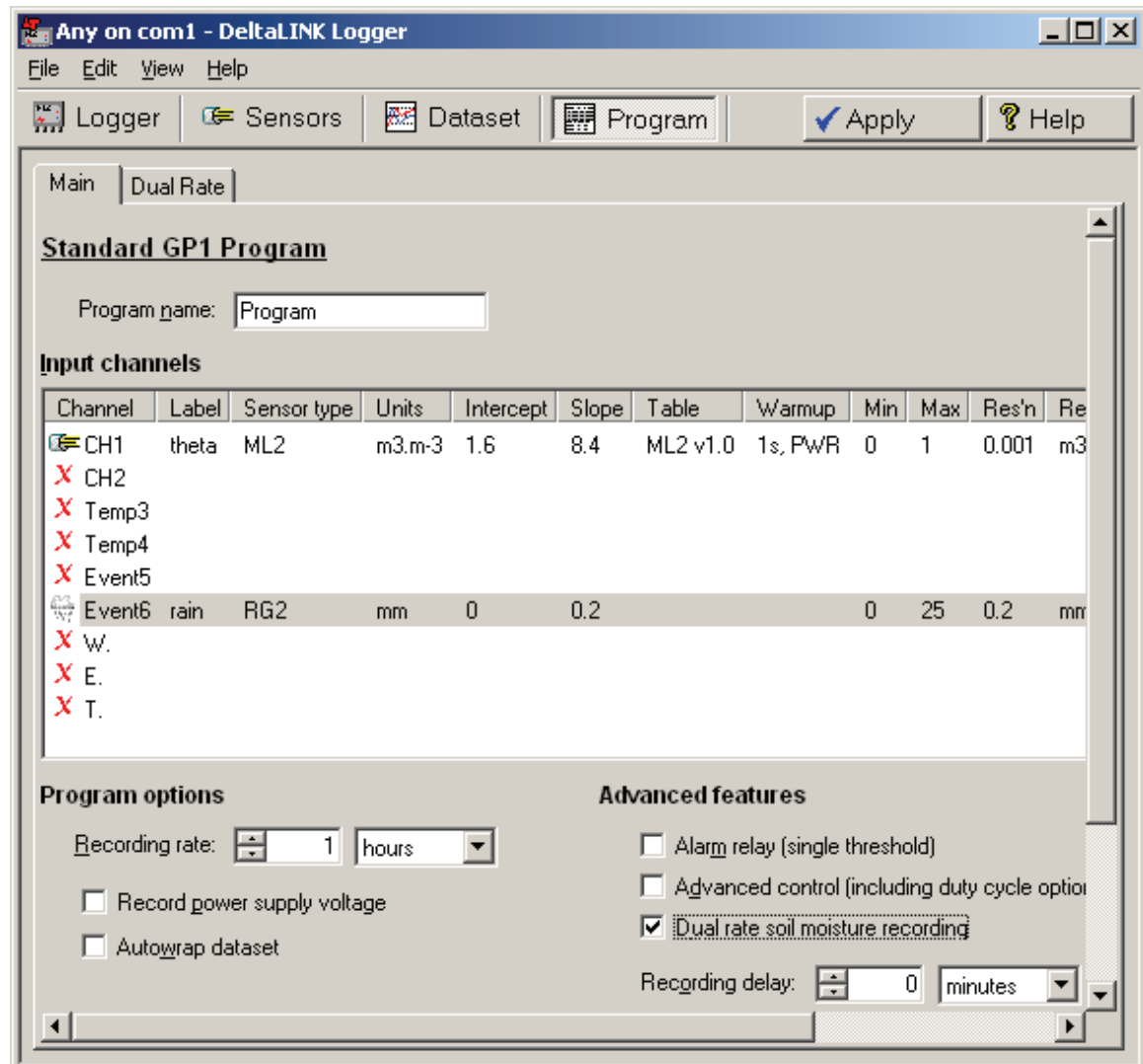
After a *hold off* period (which allows water to reach the soil moisture sensors),

.....the program starts to monitor the *rate of change* of soil moisture (*not its absolute value*).

When the *rate of change* falls below a *stabilization threshold*, the program reverts to the normal recording rate.

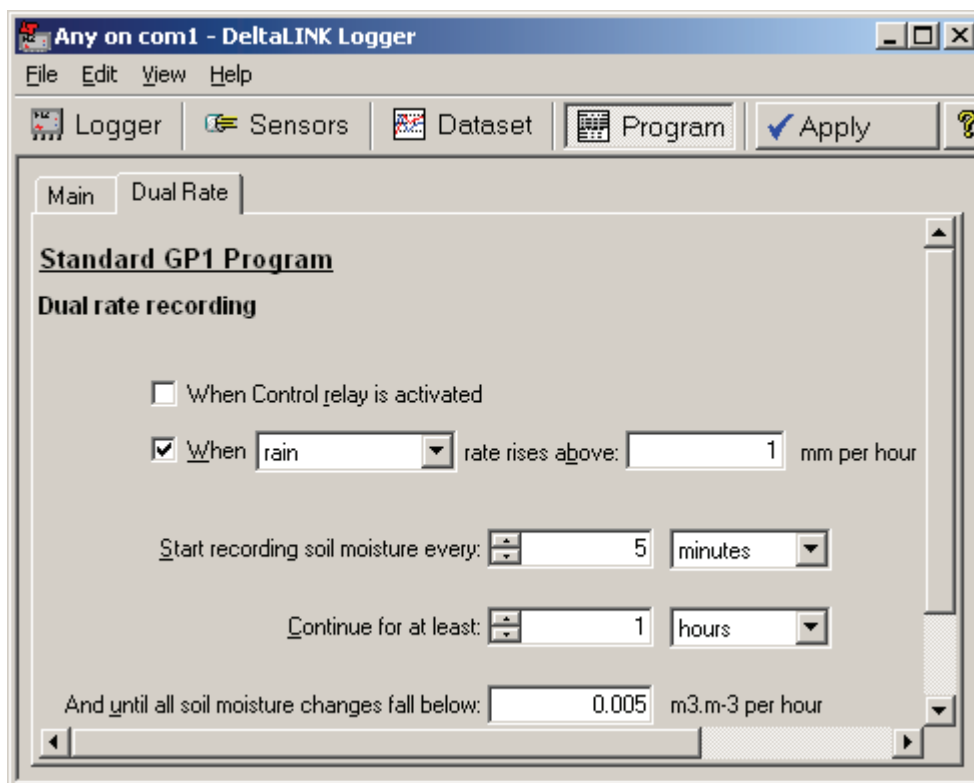
### Setting up dual rate recording

1. Select the **Main** page of a Standard GP1 or DL6 program.



2. In the **Input Channels** list, configure at least one voltage channel as a soil moisture sensor, configure DL6 channel 8 or GP1 channel Event6 as a rain gauge.
3. Under **Advanced features**, select **Dual rate soil moisture recording**.

4. Select the **Dual Rate** page, check the second, lower box labelled **When** and select rainfall.



5. **When rainfall rate rises above:** enter the *trigger* rate, i.e. the rainfall rate which starts accelerated recording e.g. 1 mm per hour. For guidance:
- 0.1 mm per hour will activate fast recording for nearly all rainfall events
  - 1mm per hour will activate fast recording only for medium and heavy rain events
  - 5mm per hour will activate fast recording only for very heavy rain events.
6. **Start recording soil moisture every:** enter the *accelerated recording rate*. This must be an exact divisor of the normal **Recording Rate** which you have entered in the **Main** page e.g. 5 minutes if you have selected a 1 hour normal recording rate.

You can now set the two conditions which control the duration of accelerated recording:

7. **Continue for at least:** enter a *hold off* period, i.e. the minimum duration of accelerated recording after the rainfall rate falls below the *trigger* rate (not from the start of accelerated recording).
8. **And until all soil moisture changes fall below:** enter a *stabilization threshold*, i.e. the **rate of change** of *all* soil moisture sensor readings at which accelerated recording stops. For guidance:
- 0.05 m<sup>3</sup>.m<sup>-3</sup> per hour is a very high rate of change
  - 0.005 m<sup>3</sup>.m<sup>-3</sup> per hour is a medium rate of change
  - 0.0005 m<sup>3</sup>.m<sup>-3</sup> per hour is slow.
- Enter 0 m<sup>3</sup>.m<sup>-3</sup> if you want fast recording to never stop, or a very high value 3600 if you want accelerated recording rate to stop immediately at the end of the hold-off period.

**Notes:** The guidance values above are not absolute. They depend on your local soil or weather conditions and experimental needs.

### How the program monitors rainfall rate

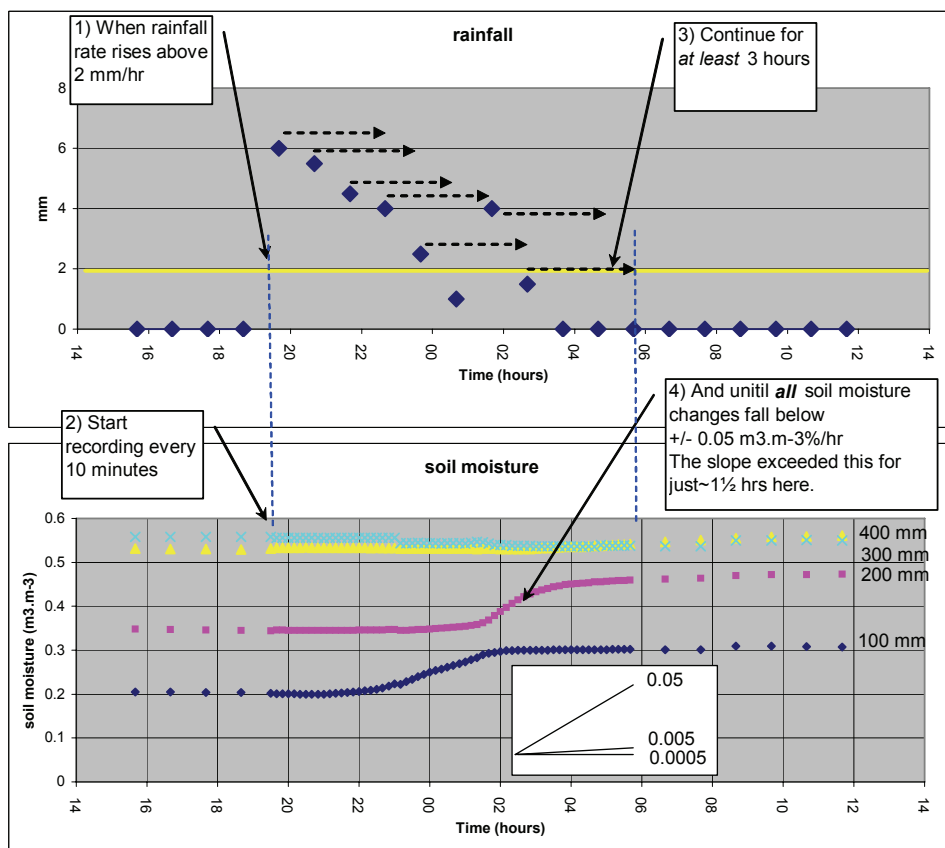
The program monitors and recalculates the rainfall rate at the time of each rain gauge event (i.e. tip) as follows:

$$\text{Rate} = (\text{Ncount} \times a1) / (\text{Tnow} - \text{Tprev})$$

where: *Rate* is the rainfall rate in rainfall units (as defined in the program, e.g., mm)  
*Ncount* is the number of rain gauge events registered in the preceding 1s (normally 1)  
*a1* is the number of mm per rain gauge event (as defined in the program)  
*Tnow* is the current time  
*Tprev* is the time of the previous rain gauge event

Note that the calculation requires a 'previous rain gauge event', so the first rain gauge event after starting the program doesn't start the accelerated recording rate.

### Dual rate recording example based on rainfall rate



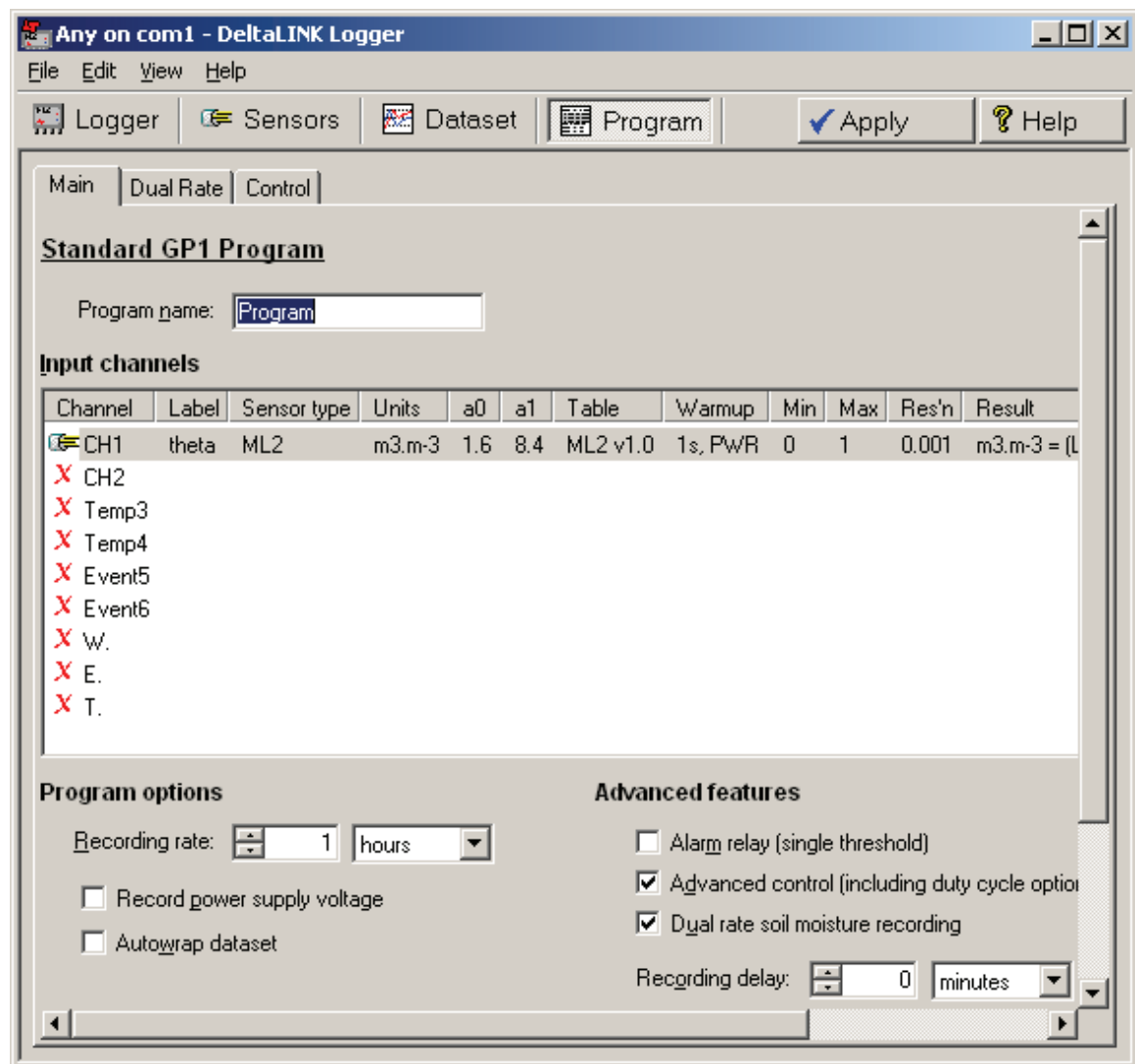
## Option 2: Dual Rate Logging based on sensor readings and enabled via the Control logic

Dual rate logging may be activated based on rate of rainfall (see Option 1 on page 1), or based on **any sensor reading and/or the time of day**, using the logic conditions set up on the **Control** tab.

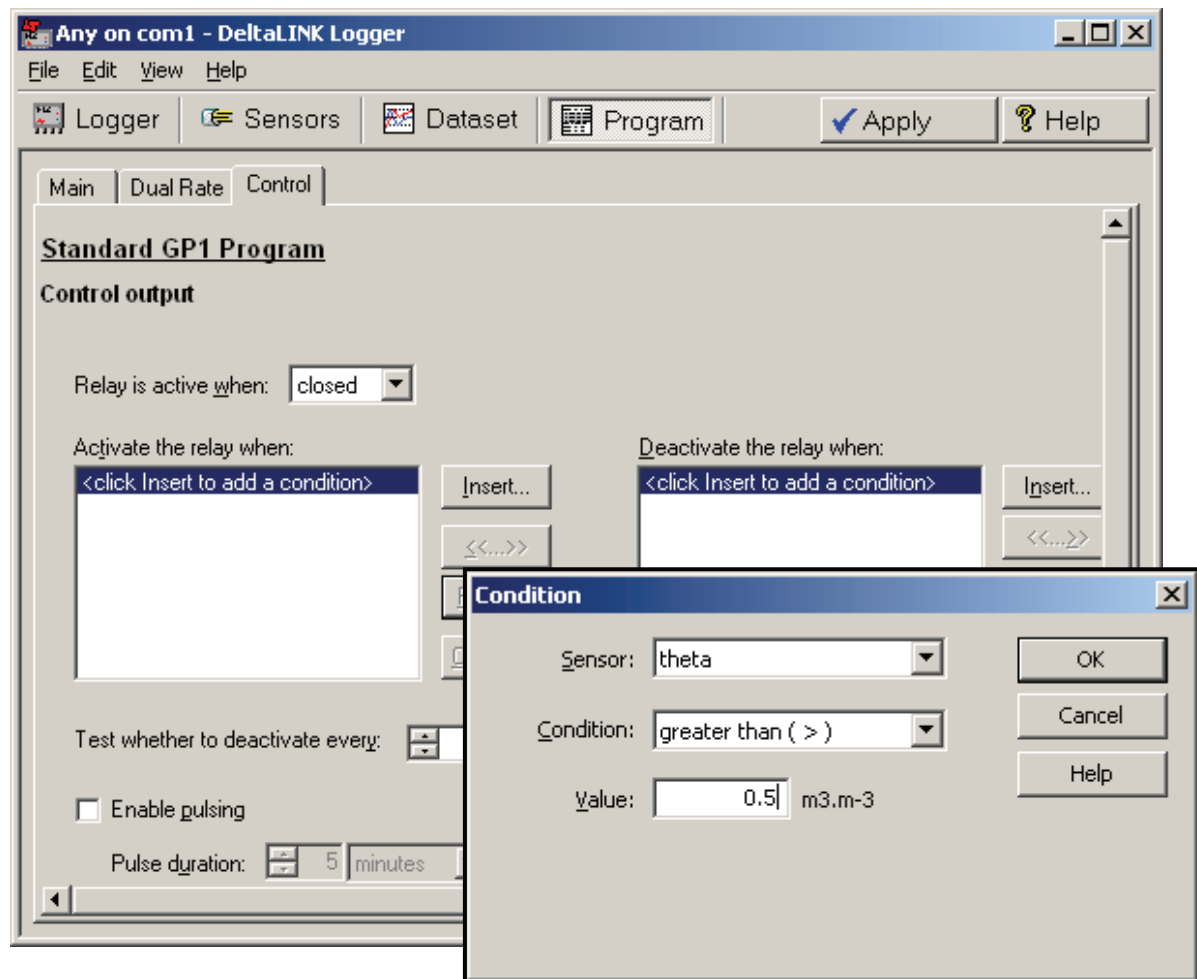
**Only soil moisture can be read and logged at the faster rate.  
At least one soil moisture sensor must be connected**

To keep this example simple we will base the conditional logic just on one soil moisture sensor.

1. Select the **Main** page of a Standard GP1 or DL6 program.



2. In the **Input Channels** list, configure at least one voltage channel as a soil moisture sensor.
3. Under **Advanced features**, select **Advanced Control** and **Dual Rate Logging**.
4. On the **Control** Page under **Activate the relay when** click **Insert** to display the activate relay Condition.



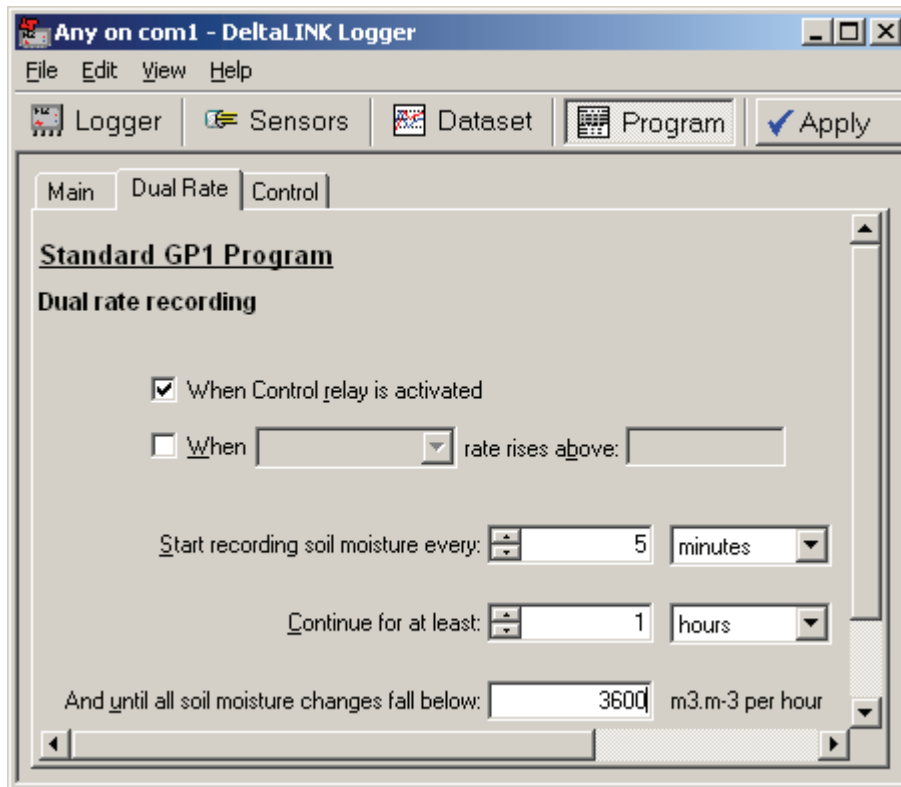
5. Select a soil moisture **Sensor** and a threshold
6. **Condition** and **Value**. This will determine when dual rate recording starts.

You can base the conditional logic on any sensor connected to the logger.  
You can also use **Time of day** as a logical condition.

7. Similarly, under **Deactivate the relay when** select a sensor and threshold reading.  
Note: the off conditional logic may also be based on any sensor and /or on **Time of day**.
8. Still on the Control page set the **Test whether to deactivate every** time.

Note: This is only the first of three tests made before the dual rate logging will stop.  
(The other two tests are "**Continue for at least**" and "**And until all soil moisture changes fall below**" on the Dual Rate page - See next page)

9. On the **Dual Rate** page check the **When Control relay is activated** box:



10. **Start Recording soil moisture every:** enter the faster logging rate as required.
11. **Continue for a least:** enter a period of time.  
Note: this period of time will not start until the deactivate logic is true from the **Control** page.
12. **And until all soil moisture changes fall below:** enter a rate of soil moisture change.

Note: If you wish to effectively disable this test then put enter a large number like 3600 m<sup>3</sup>.m<sup>-3</sup> per hour, so that the test condition is always true. Even logging once per second the rate of change (interpolated to one hour) should always be less than this.