**Transcript of MCS v.2019 MCS Traces & Isotopes Run from PAR File Tutorial**

**0:00**

In the last tutorial, I introduced you to the MCS Trace Elements & Isotopes Calculator, showed you how to input data for an RFC model, and demonstrated how to use MCS Traces. If you have not yet watched that video, please go back and do so before continuing on. Let’s navigate to our MCS folder structure, into the MCS VBL Code Folder, and let’s open up the MCS Trace Element & Isotope file.We need to “Enable Macros” … And the next pop-up box tells us which version of MCS Traces and Excel we’re running (we can click “OK” to get rid of that box…), and we’re going to need to allow Excel to communicate with the MCS Folder Structure, so just like with MCS Phase Equilibria, we need to click “OK”, make sure that the MCS Folder is selected at the top of the window, and click on “Choose” to get to the main MCS Traces interface.

**1:02**

Just like the last tutorial, the first thing we want to do is select which MCS Phase Equilibria Output File we want to model trace elements and/or isotopes for. Click on the top button to trigger a pop-up window, and using the drop-down menu, we want to select our AFC\_Tutorial Output File, and click on “finish”. Next, we’ll need to pick the Trace Elements we want to model, so click the “Periodic Table” button, and let’s hit “Load Previous Selection”. We’re going model the same trace elements and isotopes that we did in the previous tutorial. Click “OK”, and to get back to the main page of MCS Traces, we click on “Back to Main Menu”.

**2:02**

In this tutorial, instead of setting the initial concentrations of the trace elements and their partition coefficients by hand, we’re going to load them in from a previously created PAR file. This is useful if you have the same Magma and/or Wallrock and/or Recharge compositions and other parameters are changing, or if you are using a new composition, but you’d like to keep using the same partition coefficients. To load the PAR file, we’re going to click on “Load or Save Partition Coefficients, Concentrations, and Isotopes from saved PAR Files”. This will make a user form appear where we can upload our PAR file. But before we upload it, I want to bring your attention to these checkboxes on the left-hand side of this user form. When you are saving to – or, in this case, uploading from – a PAR file, you can use these checkboxes to select whether you want to load (or save) partition coefficients, trace elements, or isotopes. So, if you would only like to reuse the partition coefficients from a PAR file, but you don’t want to load the prior run’s trace element concentrations or isotopic compositions, go ahead and uncheck the boxes. You can also elect to load (or save) compositions and partition coefficients for the three different subsystems - and in the case of the Recharge subsystems, up to five different recharge events. For this run, we’re modeling AFC, without any recharge events, so we can uncheck all of the boxes that have to do with the Recharge Subsystems. Now I do want to load my isotopes and concentrations, so we’ll click those boxes to make sure they’re selected. We can select our input file from the dropdown menu, so we want to click on the arrow, and then we’ll select “PAR\_HI\_SNG\_AFC.xlsx”. So, if you can’t tell from the name, we have a Hawaiian Magma and a Sierra Nevada Granite Wallrock. We’re gonna click on that, and click on “Load from PAR File”. The MCS will upload all of the requested data from the PAR file, so once you click this button, just leave the computer alone until the MCS is finished with this process; if you interrupt loading the PAR file, you’ll need to start over again. Once MCS is finished, we can click “OK” to get back to the main MCS Traces interface.

**4:55**

From here, you’re technically good to go, and you can finish your MCS trace element model. *But*, I like to go through and triple-check that everything was loaded correctly, otherwise you won’t find out that you’ve wasted your time until it’s too late. So, we can look at the Input sheet for the Magma Subsystem by clicking on the button labeled “Set Initial Magma Trace Element Concentrations, Initial Isotope Ratios and Solid/Melt Partition Coefficients”. If you look at the partition coefficients that have been loaded, there are a couple that stand out, just because they’re so small. And I’ve done this intentionally, because I wasn’t able to find a reasonable (or in some cases, any) partition coefficient for that particular element for that particular mineral. And, you know, there’s never going to be ZERO partitioning of the trace element into the mineral, but we don’t want to make too many assumptions so let’s set it very, very, very small – at 1x10-6. Now that we’ve checked our numbers, it looks like our Magma composition and our solid-melt partition coefficients are accurate, but remember to click through and double-check the solid-fluid partition coefficients as well. Let’s click on “Go to Next” to navigate to our solid-H2O partition coefficients and make sure that they’re all set to 10,000. After you have done this, click the “Go to Next” button again – we need to set these to 10,000 as well, but this time, remember, we have CO2 as the exsolved fluid phase instead of H2O. Once we’ve double-checked that our compositions and partition coefficients set for the Magma Subsystem have been loaded correctly, we want to click on “Back to Main Menu” to return to the main interface.

**6:43**

In the last tutorial, we had two recharge events triggered, but no assimilation occurred. In this run, we’re considering the effects of assimilation, but no recharge events are set. During AFC, the Magma Chamber Simulator allows the wallrock to partially melt, changing its residual composition, as well as the composition of the partial melt. So, in addition to the initial concentrations of trace elements and isotopes in the Wallrock subsystem, we will also need to input partition coefficients appropriate for that Wallrock composition. We’re going to do this the exact same way we did for the Magma Subsystem, by clicking on the next button, labeled “Set Initial Wallrock Trace Elements Concentrations, Initial Isotope Ratios and Solid/Melt Partition Coefficients”. Again, our wallrock is a Sierra Nevada granitoid composition, so the initial composition I’ve input here looks good. Now, I do want to point out that because of the compositional differences between the Magma and Wallrock subsystems, the partition coefficients that I’ve assigned *here* are different than the ones assigned to the Magma Subsystem (just something to keep in mind when you’re setting your partition coefficients for your own runs). We also need to double-check that our solid-H2O and solid-CO2 partition coefficients are set to 10,000, because we’re not considering the effects of a volatile phase. So click the “Go to Next” button, make sure these are all set to 10,000, and click it again to check for CO2. Once we’ve double-checked that our compositions and partition coefficients set for the Wallrock Subsystem have been loaded correctly, we want to click on “Back to Main Menu” to return to the main interface.

**8:29**

From here, we can go ahead and run MCS Trace Elements as normal. Click on the final button, “Perform MCS Trace Element & Isotopes Computation”, and come back in a few minutes. (*Sweet instrumental elevator music interlude accompanies the MCS Trace Element calculations.*)

**12:41**

Once the calculation has finished (an excruciatingly long three-quarters of *The Girl from Ipanima later*…), the results are automatically saved as new sheets in your MCS Output File, and MCS tells us so by way of this pop-up window. We can click on “OK”, and now we’re back to the main MCS Traces interface again. If you don’t have any other Trace Element models to run, you can close out MCS Traces – and remember, *do not save the file*. This concludes this tutorial on how to run a MCS Trace Elements model using a previously-created PAR file. In our final tutorial, I’ll walk you through how to read the MCS Trace Elements Output sheet that gets appended to the phase equilibria Output File.

**13:42**