



**Trends based on the original and
reanalysis of 15-years of IMPROVE
samples from three sites**

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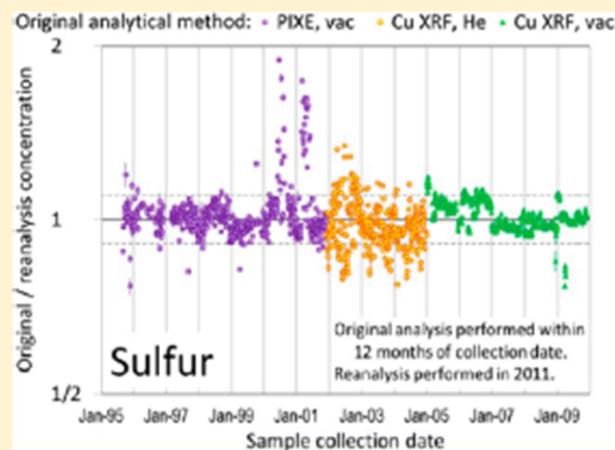
October 2013

Reanalysis of Archived IMPROVE PM_{2.5} Samples Previously Analyzed over a 15-Year Period

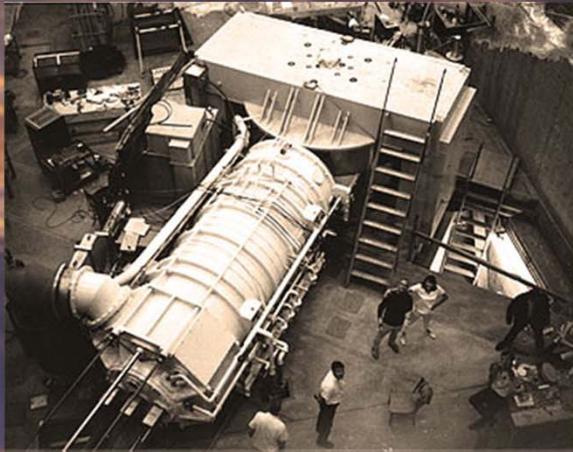
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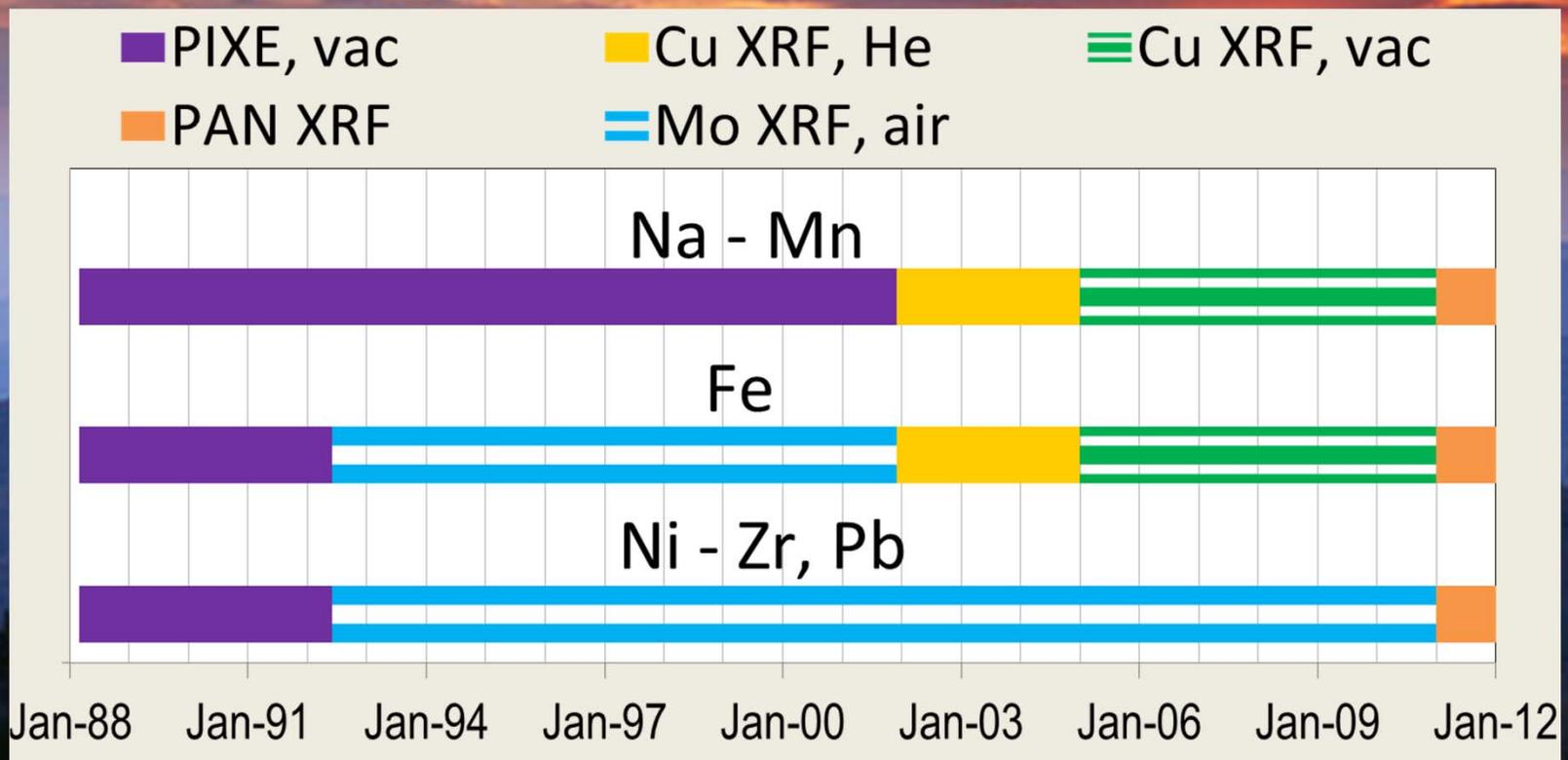
ABSTRACT: The IMPROVE (Interagency Monitoring of Protected Visual Environments) network has collected airborne particulate matter (PM) samples at locations throughout the United States since 1988. These samples have been analyzed for elemental content using analytical methods that evolved over the years. Changes in analytical methods sometimes introduced shifts in reported concentrations that are evident in the historical record. We sought to illuminate the effects of methodological changes by reanalyzing archived samples with current methods. To test the feasibility of this approach, the 15-year archive of PM samples from Great Smoky Mountains National Park was selected for reanalysis as a single analytical batch using a common protocol and calibration. Comparisons of the reanalyses and original analyses indicate that concentrations of all but one measured element, Br, remained stable on the filters over years of storage. The agreement between the two analyses varied with element and original measurement method. For elements measured well above their contemporary detection limits – S, K, Ca, Fe, and Zn – the reanalysis established that method changes had limited impacts on reported concentrations, generally <10%. For elements originally measured near their detection limits, reanalysis confirmed the presence of discontinuities in the data record, many of which were previously recognized and documented as method-related.



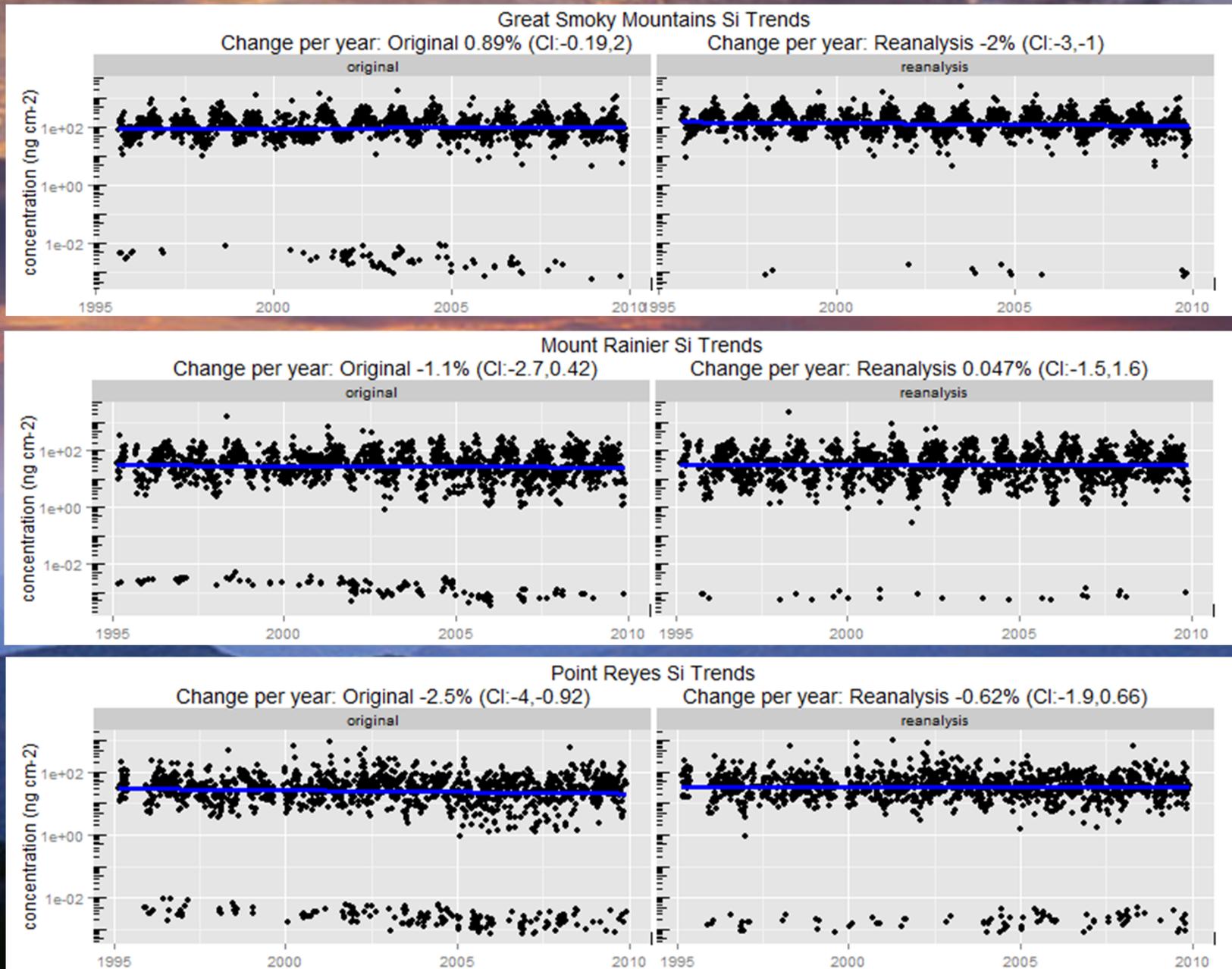
IMPROVE Elemental Analysis Methods



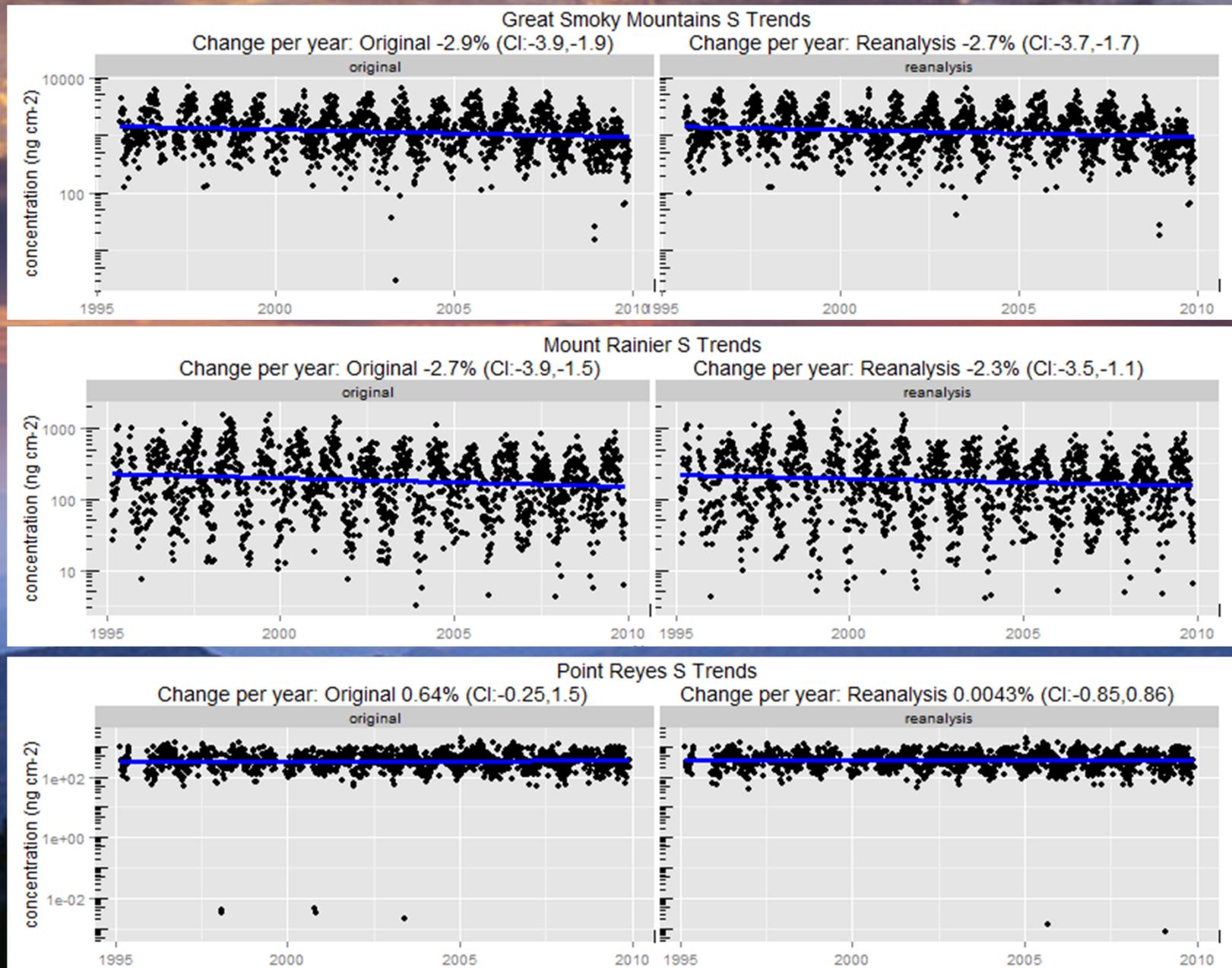
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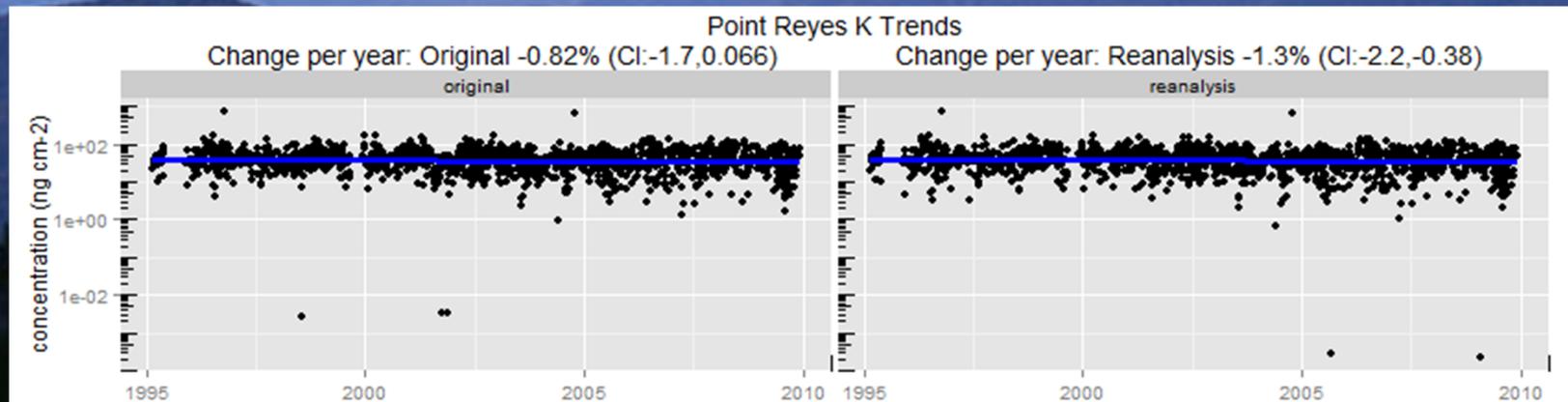
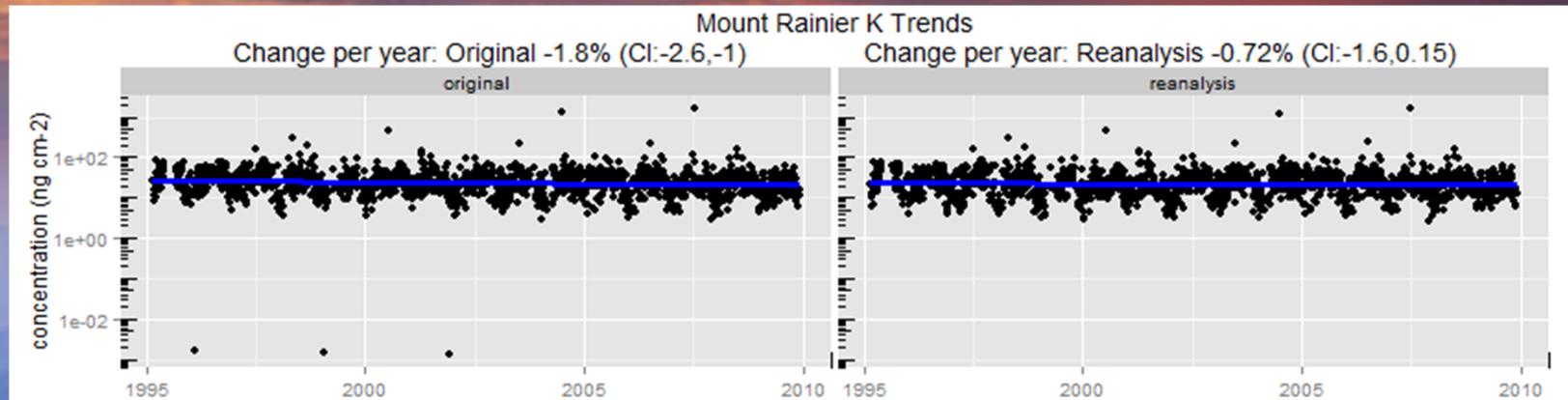
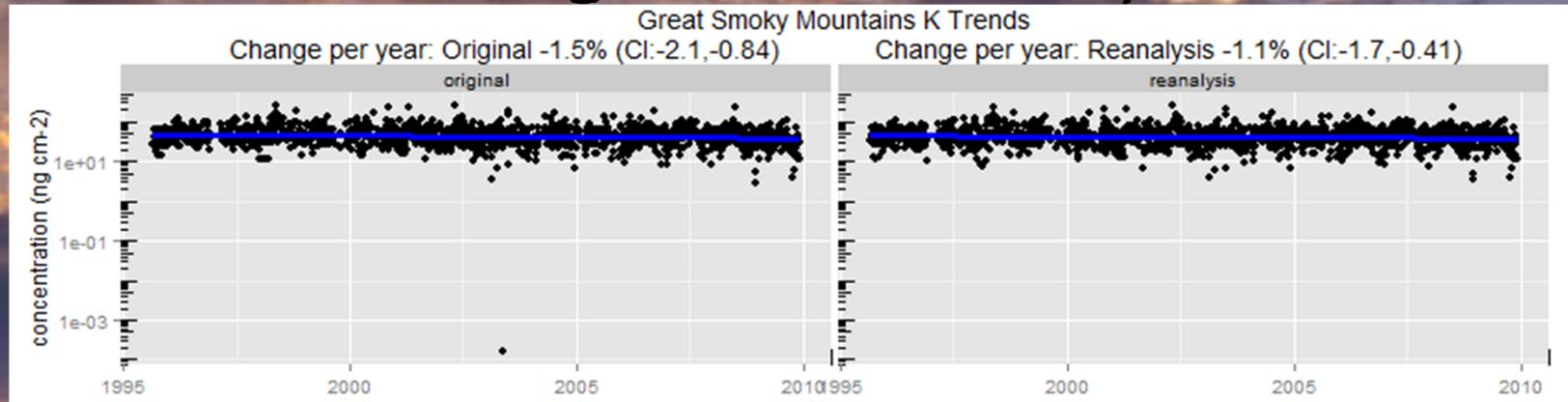
Silicon: Original and Reanalysis Trends



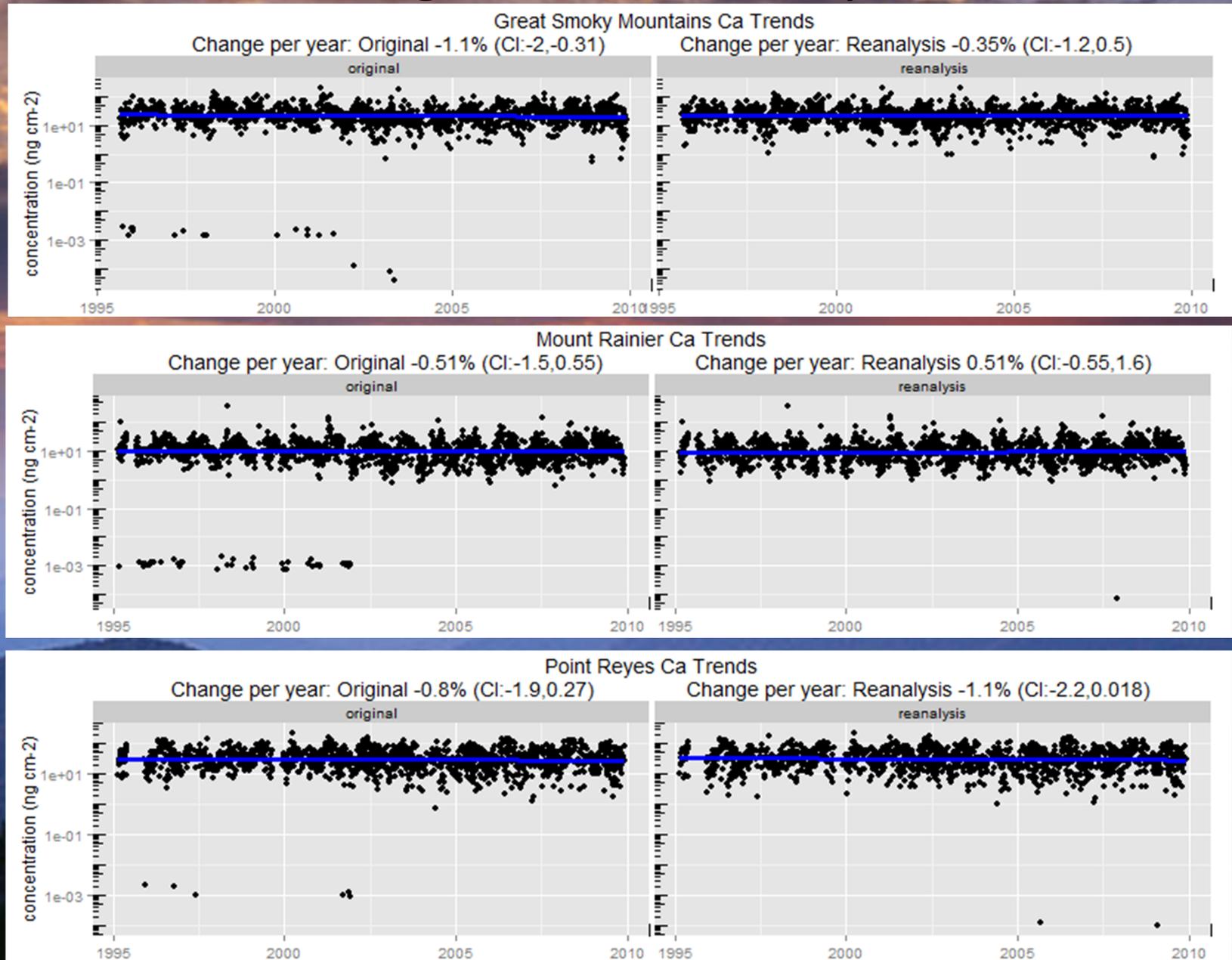
Sulfur: Original and Reanalysis Trends



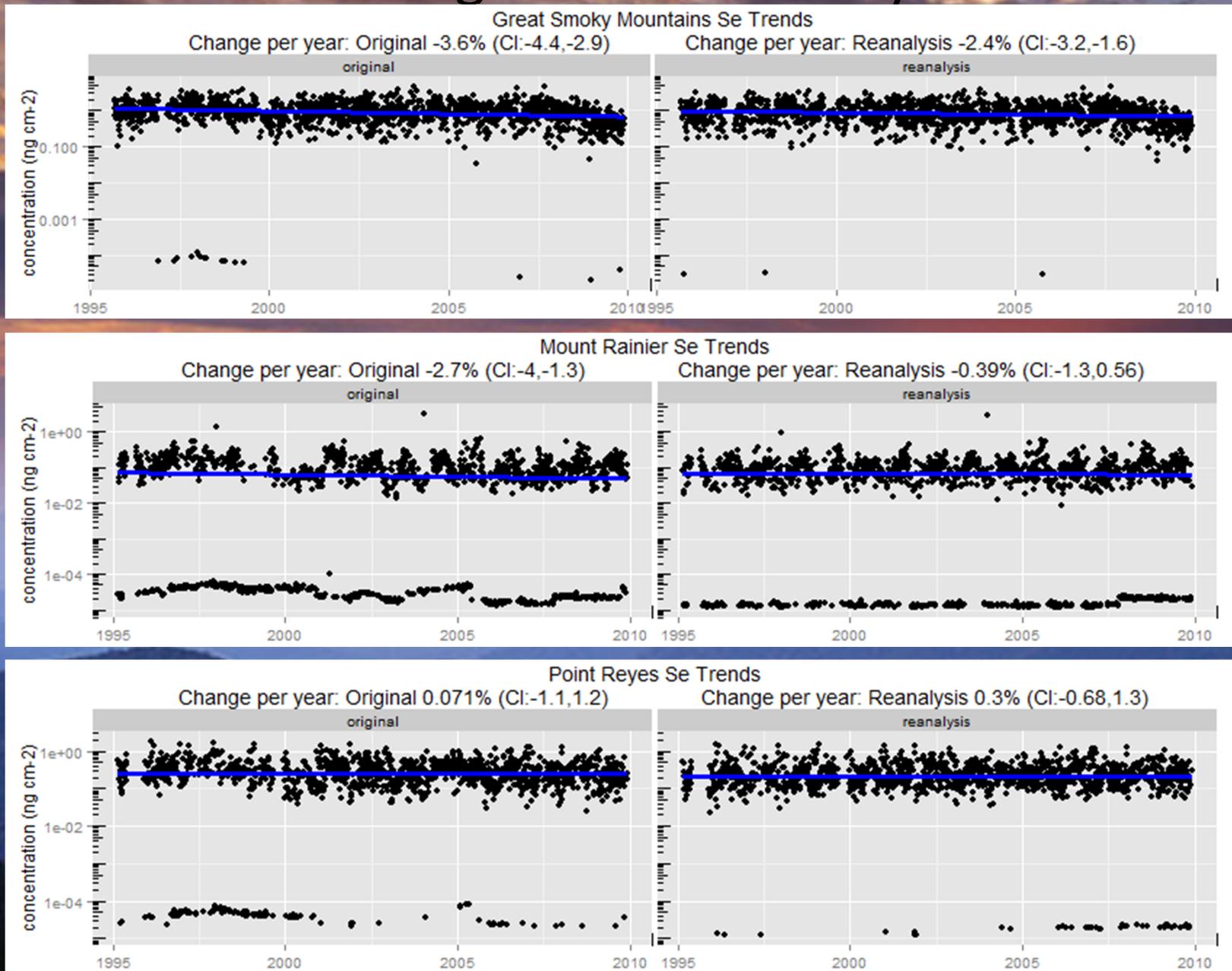
Potassium: Original and Reanalysis Trends



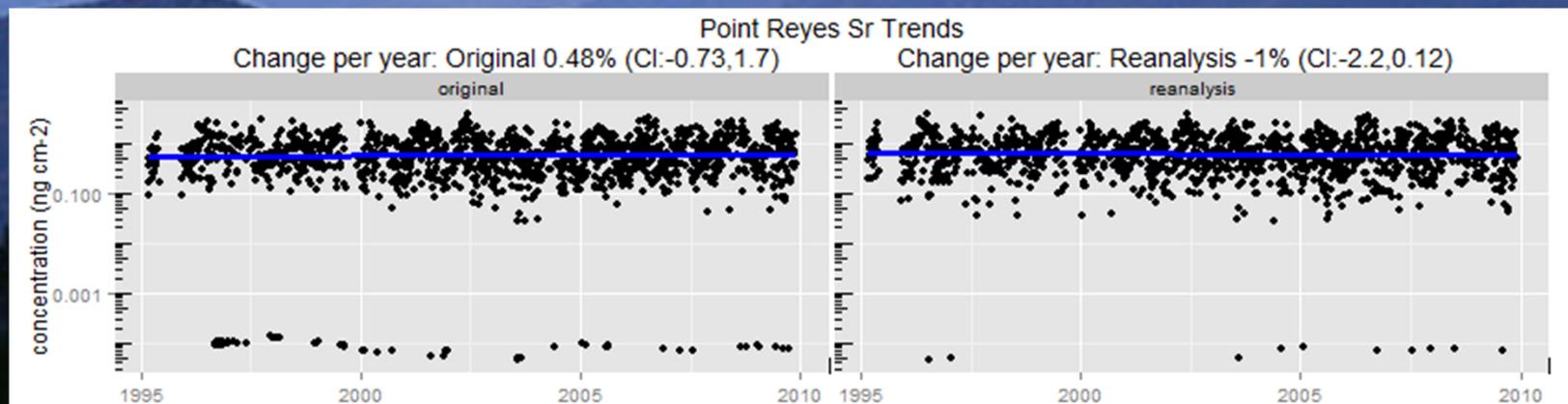
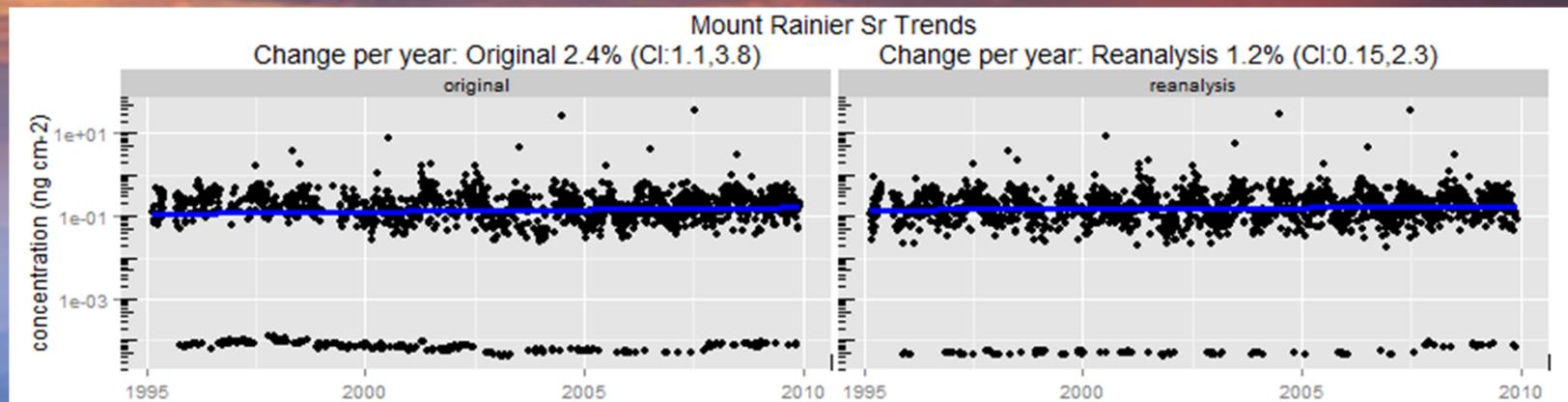
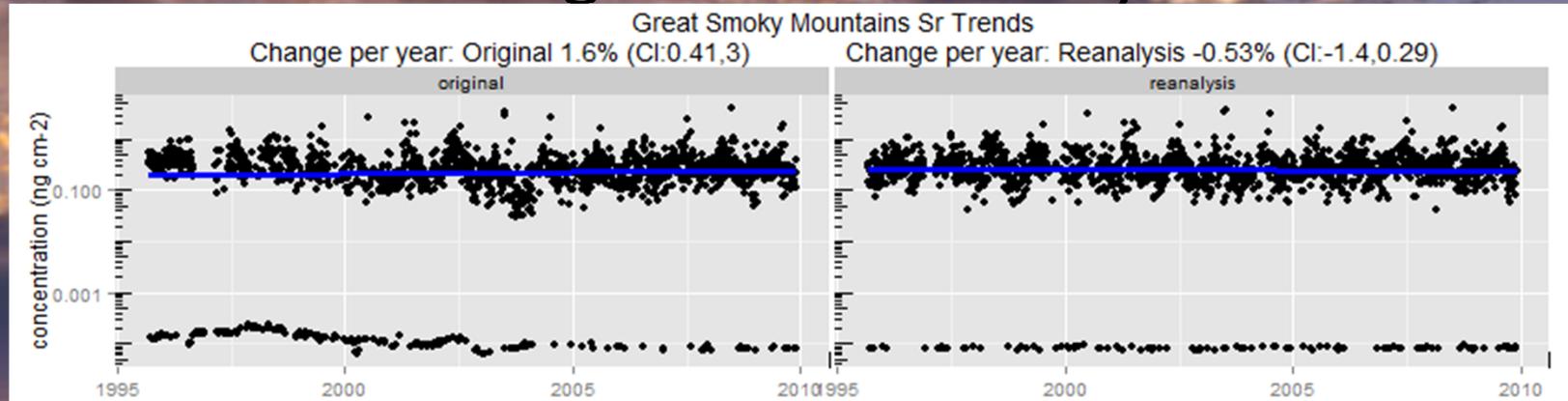
Calcium: Original and Reanalysis Trends



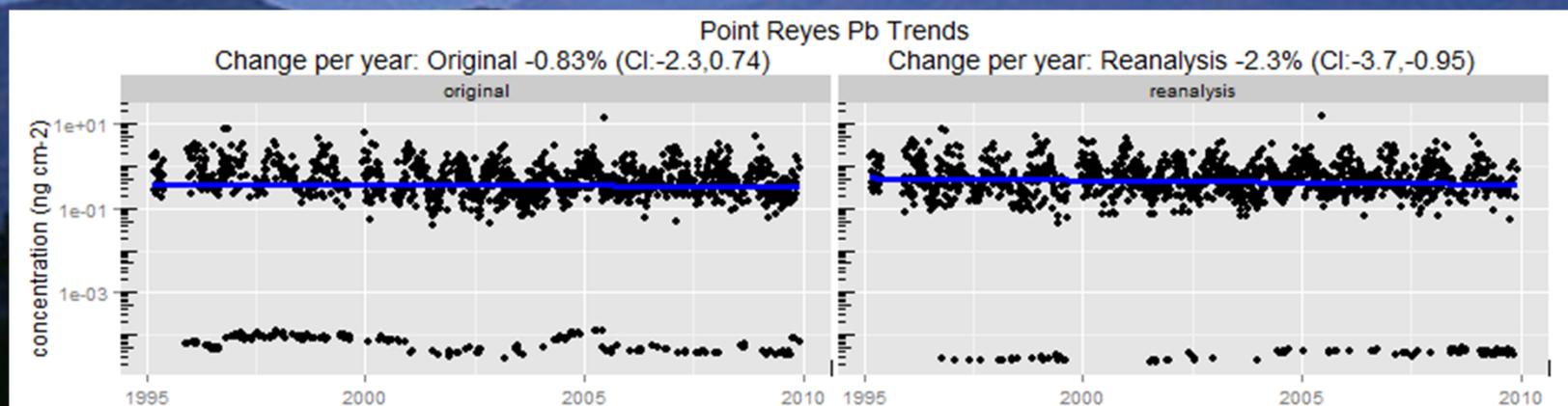
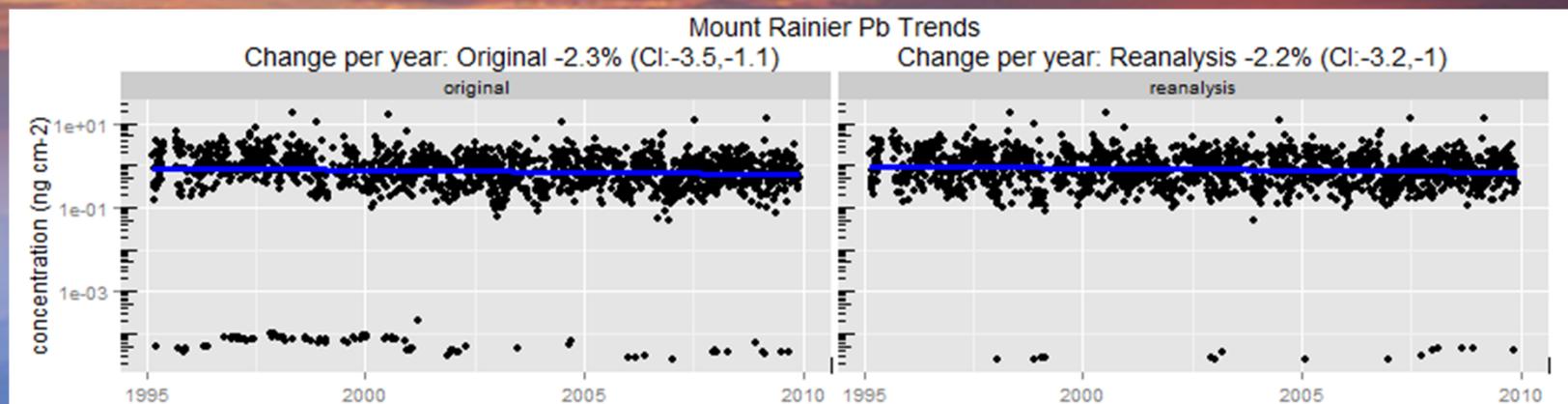
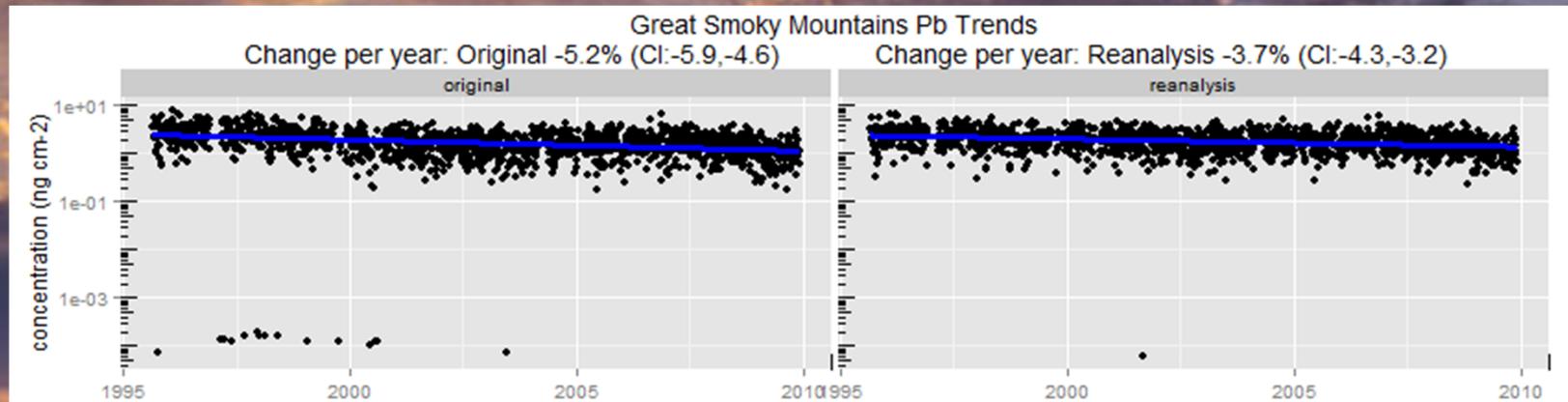
Selenium: Original and Reanalysis Trends



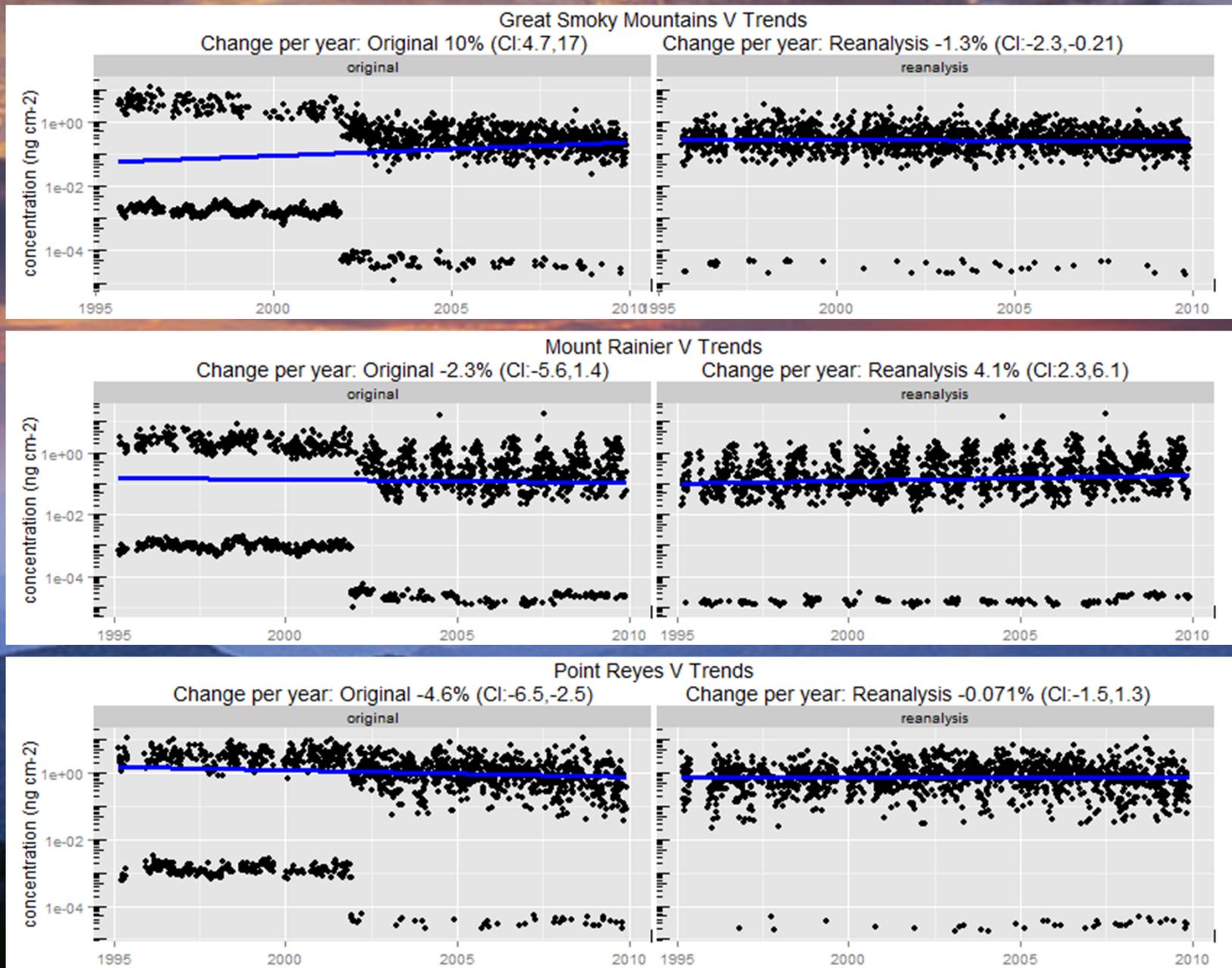
Strontium: Original and Reanalysis Trends



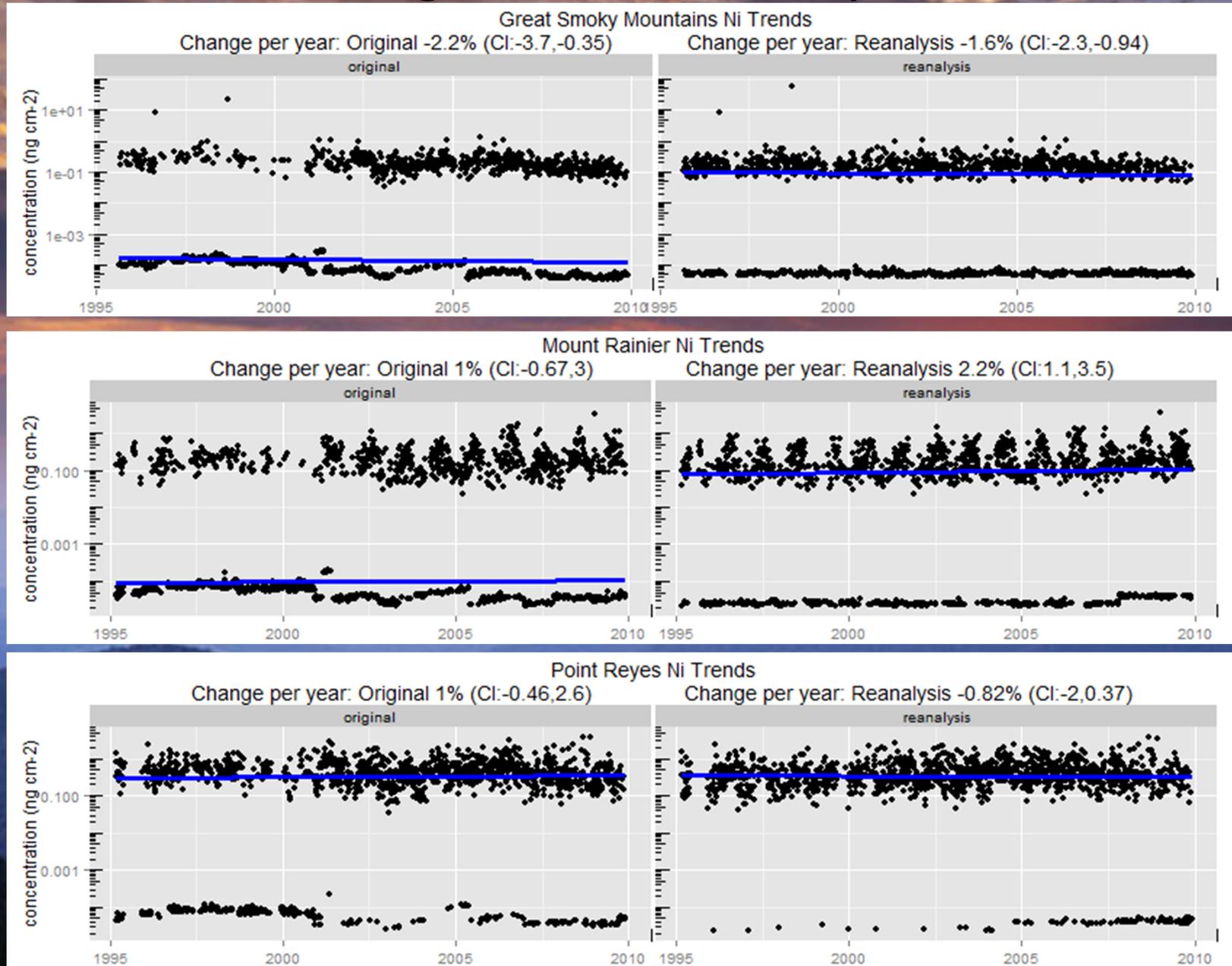
Lead: Original and Reanalysis Trends



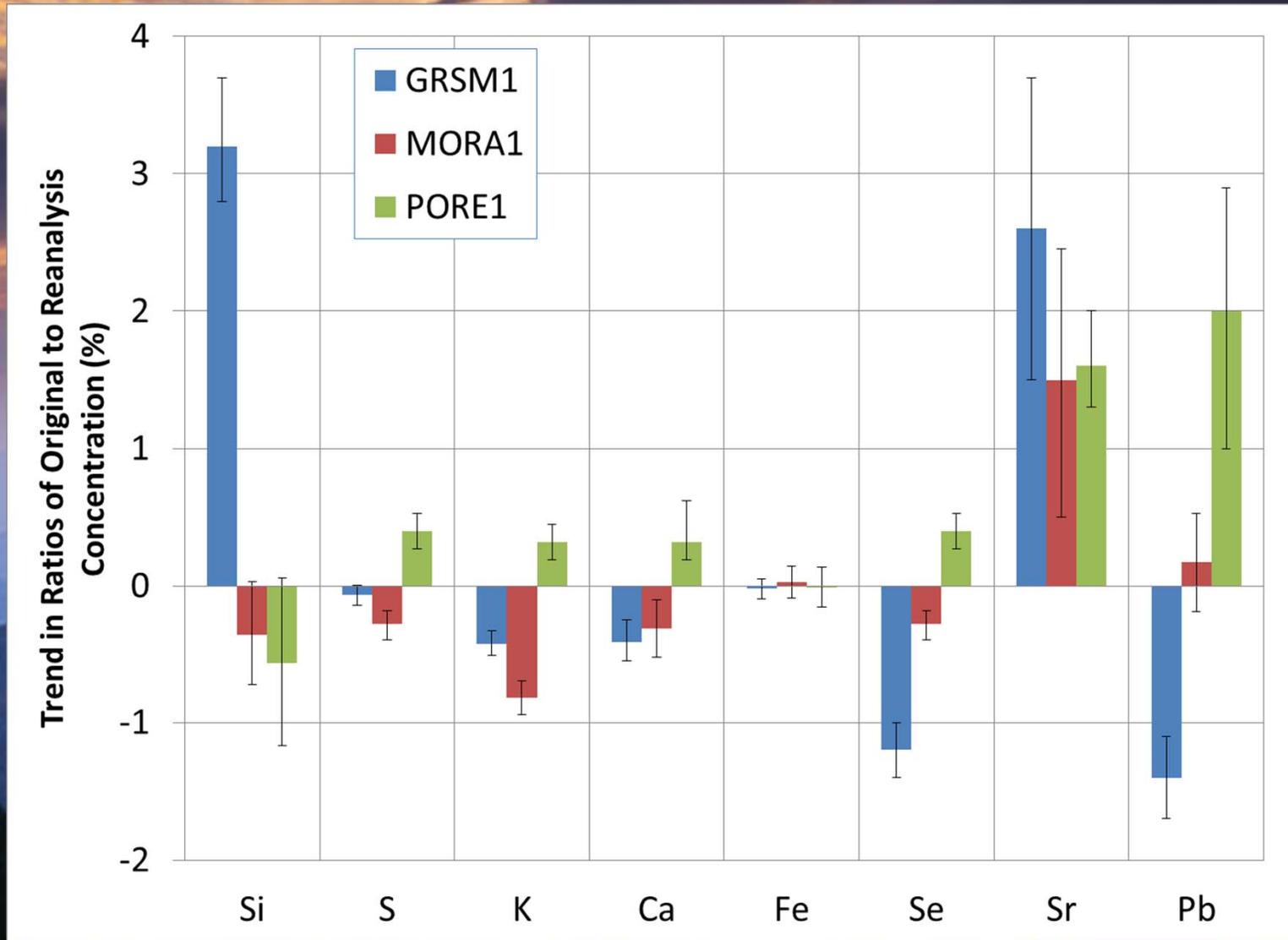
Vanadium: Original and Reanalysis Trends



Nickel: Original and Reanalysis Trends



Consistency Across Sites?



Observations

- Differences between original and reanalysis trends are not consistent across sites
- Different ranges of concentrations at three sites may be causing differences