Variation in ionic radius between and within elements

The plot below shows how radius of ions varies with charge. A simple and intuitively satisfying summary would be "put more electrons on an atom, and it gets larger; take them off and it gets smaller". Because electrons carry negative charge, that summary leads to a similarly simple statement that "the greater the charge, the smaller the ion".

The plot compares data across elements (the black curves) and variation within elements (the colored curves, with a different curve for each element). For each black curve, the number of protons increases, increasing the attraction of a fixed number of electrons (the number in the nearest noble gas). For each colored curve, the number of electrons decreases around a nucleus with a fixed number of protons defining that element. Ionic radius is significant mineralogically because the size of an ion is critical in establishing whether that ion fits into a particular site in a possible mineral structure. Ionic potential, or charge divided by radius (shown here with gray lines), is significant geochemically because much geochemical behavior depends on ionic potential.

Each black curve joins ions that all have the same ideal-gas-like configuration of outer shell electrons, and thus ions that have the same number of electrons. Each colored curve joins ions of one element.