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Multiplicity of the trivial representation in rank-selected homology of the partition lattice.

We will discuss how two very different methods for getting at the multiplicity of the trivial representation in the rank-selected homology of the partition lattice provide complementary results, making use of the same structure in different ways. On the one hand, a partitioning for the quotient complex $\Delta(\Pi_n)/S_n$ allows us to give lower bounds on the multiplicity for various rank sets S by exhibiting minimal faces of support S in the partitioning. On the other hand, the spectral sequence of a filtered complex provides upper bounds on these same multiplicities. In particular, we use the partitioning to verify a conjecture of Sundaram that certain multiplicities are positive and to give related positivity results, and we use spectral sequences to show that most of the remaining multiplicities are zero.

This is joint work with Philip Hanlon.