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The first connection between (specialized) Macdonald polynomials and the quantum K -theory of flag manifolds was found by Braverman-Finkelberg, via their q -Whittaker functions. Kato-Naito-Sagaki and their collaborators discovered another connection, via the level-zero extremal weight modules over quantum affine algebras. In both cases, the semi-infinite flag manifolds were also involved. I will survey these connections, and will present our new results on the quantum K -theory side. Among them is a combinatorial multiplication formula (of Chevalley-type) in the equivariant quantum K -theory of flag manifolds. This is based on the so-called quantum alcove model, which is also relevant to the specializations of Macdonald polynomials mentioned above. (Received January 25, 2022)