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**The Invariant differential operators on Cartan motion groups
and range characterizations for matrix Radon transforms.**

In this talk, we first construct invariant differential operators on Cartan motion groups which can be regarded as generalizations of Pfaffian type operators on real Grassmannians. Next we give range characterizations for matrix Radon transforms on related homogeneous spaces in terms of these invariant differential operators.(joint with Fulton B. Gonzalez).