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Kyo Nishiyama, Bent Ørsted

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REAL DOUBLE FLAG VARIETIES FOR THE SYMPLECTIC GROUP

KYO NISHIYAMA AND BENT ØRSTED

ABSTRACT. In this paper we study a key example of a Hermitian symmetric space and a natural associated double flag variety, namely for the real symplectic group G and the symmetric subgroup L , the Levi part of the Siegel parabolic P_S . We give a detailed treatment of the case of the maximal parabolic subgroups Q of L corresponding to Grassmannians and the product variety of G/P_S and L/Q ; in particular we classify the L -orbits here, and find natural explicit integral transforms between degenerate principal series of L and G .

INTRODUCTION

The geometry of flag varieties over the complex numbers, and in particular double flag varieties, have been much studied in recent years (see, e.g., [FN16], [HT12], [Tra09], [FGT09] etc.). In this paper we focus on a particular case of a *real* double flag variety with the purpose of understanding in detail (1) the orbit structure under the natural action of the smaller reductive group (2) the construction of natural integral transforms between degenerate principal series representations, equivariant for the same group. Even though aspects of (1) are known from general theory (e.g., [KM14], [KO13] and references therein), the cases we treat here provide new and explicit information; and for (2) we also find new phenomena, using the theory of prehomogeneous vector spaces and relative invariants. In particular the Hermitian case we study has properties complementary to other well-known cases of (2). For this, we refer the readers to [KS15], [MØO16], [KØP11], [CKØP11], [Zha09], [BSKZ14] among others.

Thus in this paper we study a key example of a Hermitian symmetric space and a natural associated double flag variety, namely for the real symplectic group G and the symmetric subgroup L , the Levi part of the Siegel parabolic P_S . We give a detailed treatment of the case of the maximal parabolic subgroup Q of L corresponding to Grassmannians and the product variety of G/P_S and L/Q ; in particular we classify the open L -orbits here, and find natural explicit integral transforms between degenerate principal series of L and G . We realize these representations in their natural Hilbert spaces and determine when the integral transforms are bounded operators. As an application we also obtain information about the occurrence of finite-dimensional representations of L

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