

## Research Report (April, 2019 - March, 2020)

Enrollment from  
April 2017

Department of Pure Mathematics and Applied  
Mathematics

Yoshiki Kaneko

### **I. List of Papers**

### **II. List of Talks**

1. Yoshiki Kaneko "Local Solutions of  $tt^*$ -Toda equations from generalized flag manifolds" Kanto Wakate geometry seminar, Tokyo Metropolitan University, 2019/6/15
2. Yoshiki Kaneko "Solutions of  $tt^*$ -Toda equations from flag manifolds"(Poster session) Ibunya Igyousyu , Tokyo University, 2019/10/26
3. Yoshiki Kaneko "Virasoro algebra and coadjoint action" Koriyama Geometry and Physics Days, 2020/2/9
4. Yoshiki Kaneko "Pseudodifferential symbols and Hamiltonian equations" Koriyama Geometry and Physics Days, 2020/2/9

### **III. Research Results in AY2019**

It was claimed that from the quantum cohomology of  $CP^n$  we have a global solution of the  $tt^*$ -Toda equations by Cecotti and Vafa. From this claim, M. Guest and other researchers showed that we have the  $tt^*$ -Toda equation by using the DPW method from the DPW potential including the Dubrovin connection from quantum cohomology. In 2018, I showed that for  $SU(n+1)$ ,  $Sp(2n)$  and  $Spin(2n)$ , we obtain local solutions of the  $tt^*$ -Toda equations from the quantum cohomologies of  $CP^n$ ,  $CP^{2n-1}$  and  $Q_{2n-2}$ . In 2019, I obtained some other new solutions of the  $tt^*$ -Toda equations in the Lie group types  $B_n$ ,  $E_6$  and  $E_7$ . In addition, I showed the theorem that if we consider a minuscule weight and the homogeneous space with respect to its weight, then we obtain a solution of the  $tt^*$ -Toda equations.

### **IV. Research Plan for AY2020**

I think two directions of my research. First one is that I show the condition that a fundamental weight is minuscule is the necessary and sufficient condition of the condition that we obtain the  $tt^*$ -Toda equations from the quantum cohomology of homogeneous spaces. Last year I showed that in  $Spin(2n+1)$  we cannot obtain a solution from the weight with respect to the standard representation. Its weight is not minuscule. Hence we expect the above claim holds.

The other one is that I would like to obtain some information of solutions of the  $tt^*$ -Toda equations from the condition of minuscule weights. In present, we have local solutions near the origin of the  $tt^*$ -Toda equations and Stokes matrix near the origin. I will study these things especially in the case of minuscule weights.