AbstractID: 11529 Title: Dosimetric impact of the choice of a deformation algorithm for 4D treatment plannings with and without density correction

Purpose: To compare the performance of two image registration algorithms used to obtain deformation vector fields (DVF) in the context of 4D radiation therapy, where DVFs are used to remap the dose on a reference breathing phase. **Method and Materials:** Two image registration methods were used in this study: 1) a multiresolution B-splines using mutual information as a similarity measure 2) a Demons algorithm using a sum of squared differences as a similarity measure. The algorithms were implemented with the ITK toolkit and tested on a lung tumor case for which 4D data were available. The DVFs obtained were used in a simple anterior/posterior treatment plan with and without heterogeneity corrections. The doses were warped on the reference phase using a trilinear remapping with octant subdivision. **Results:** Large dose differences (20 Gy) were locally observed in the penumbra between static and motion-corrected dose distributions but those differences had no effect on the CTV coverage. Indeed, Accounting for the tissue heterogeneity was shown to have more impact on the CTV mean dose than accounting for breath-induced deformation (4 Gy compared to less than 1 Gy). **Conclusion:** Even though the accumulated dose distributions in the treatment of lung tumors is sensitive to the properties of the deformation vector fields (DVFs) used, no significant dosimetric difference was observed between the B-splines corrected-motion and the Demons corrected-motion map doses. This situation is due to properly set structure margins, if these margins were to be tightened the differences would most probably increase.