

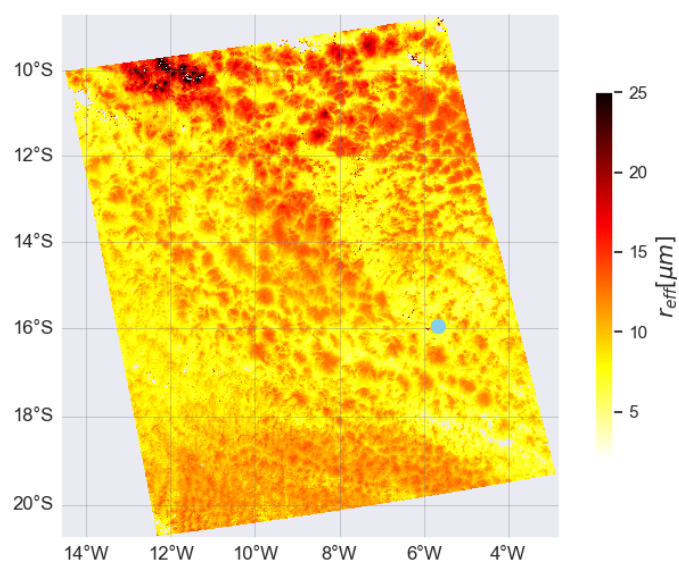


Figure 1 Reff of MODIS frame

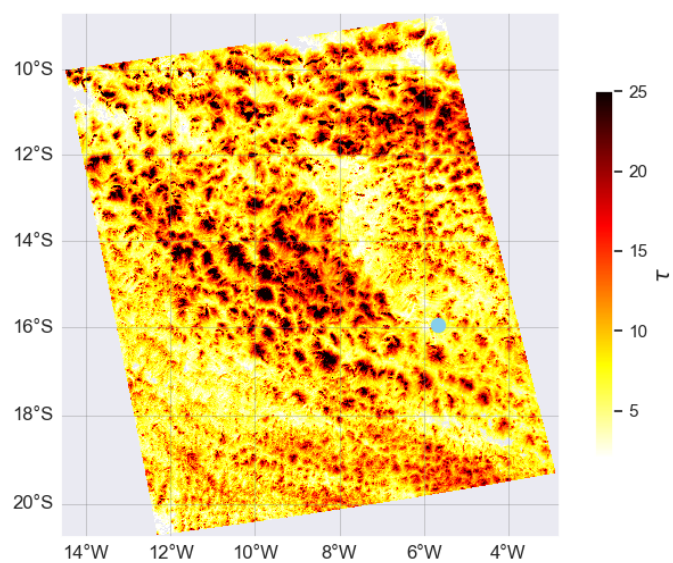


Figure 2 optical depth of MODIS frame

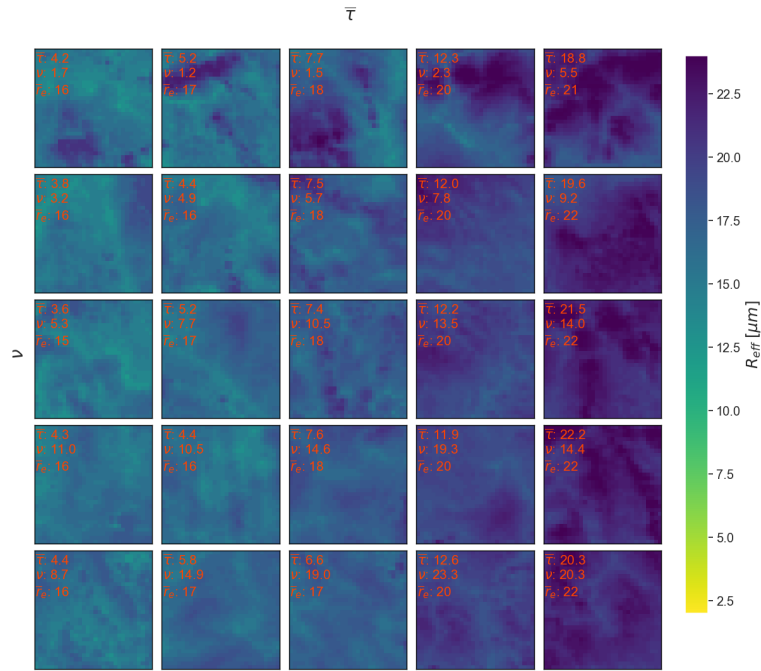


Fig. 3 Effective Radius with $N_d=25$

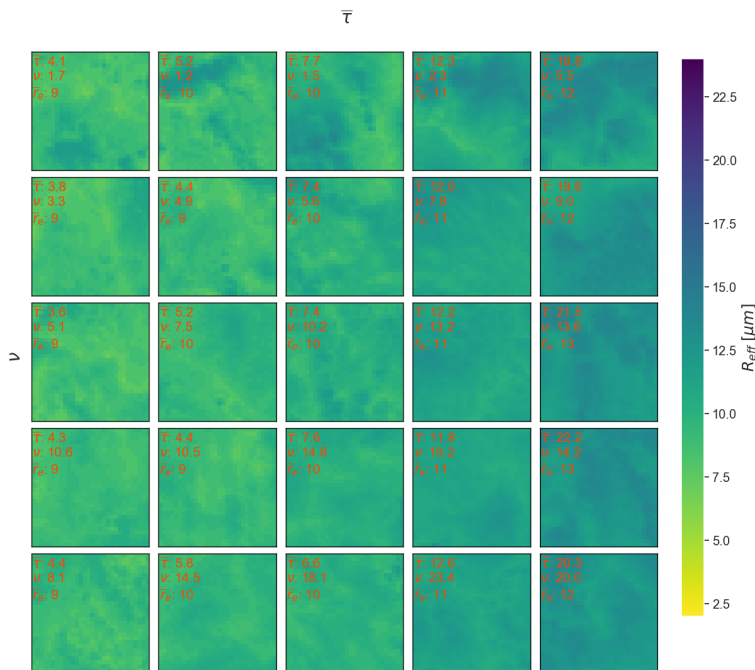


Fig. 4 Effective Radius with $N_d=100$

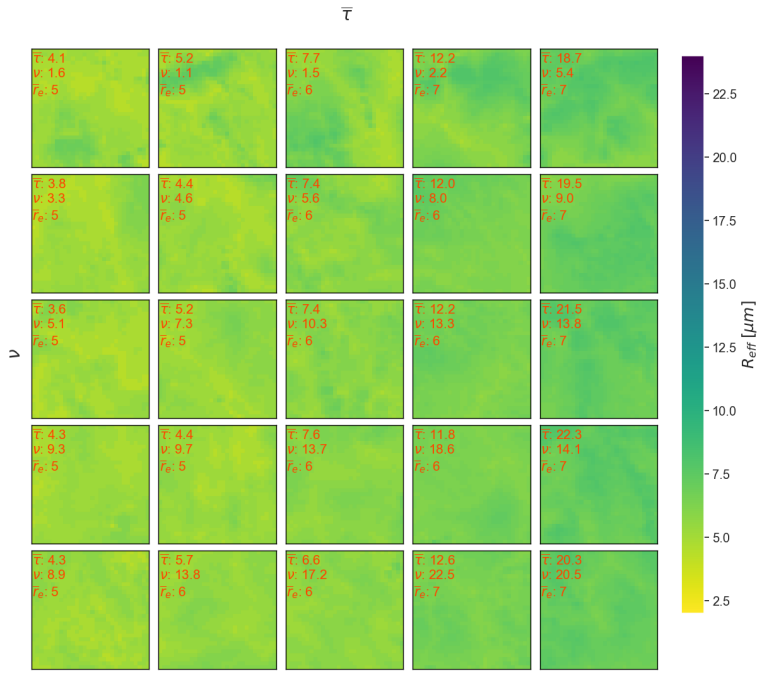


Fig. 5 Effective Radius with Nd=400

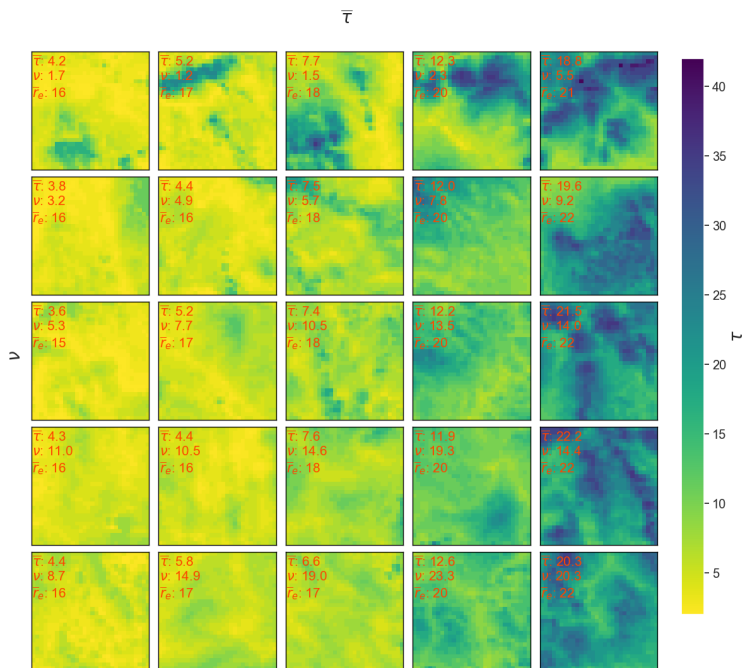


Fig. 6 Cloud optical depth with Nd=25

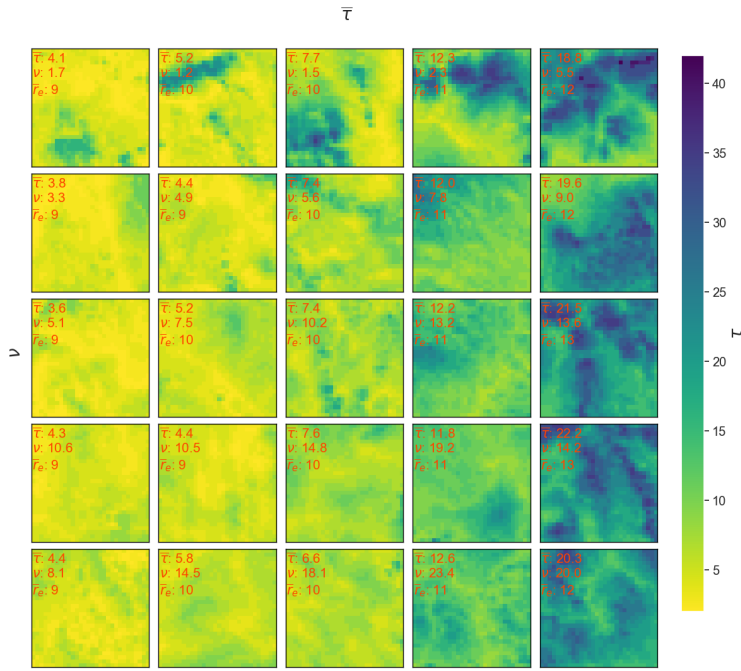


Fig. 7 Cloud optical depth $N_d=100$

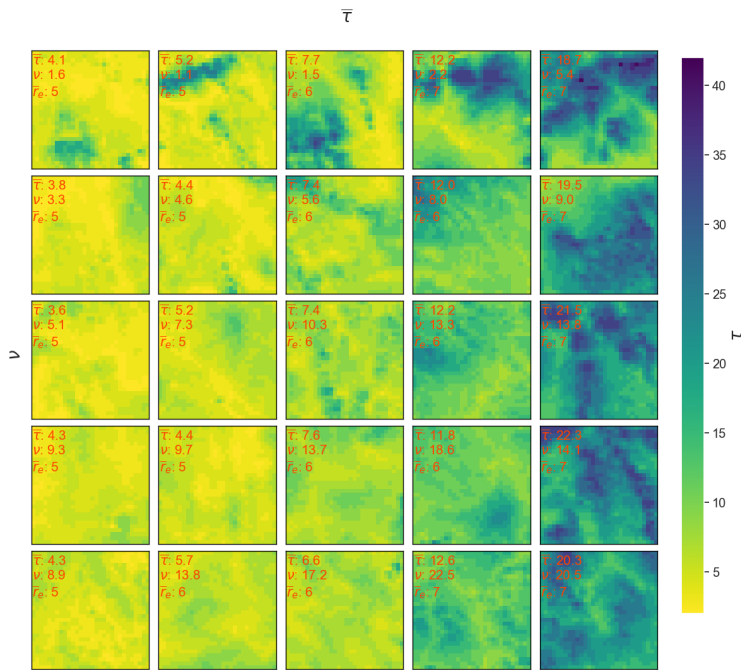


Fig. 8 Cloud optical depth $N_d=400$

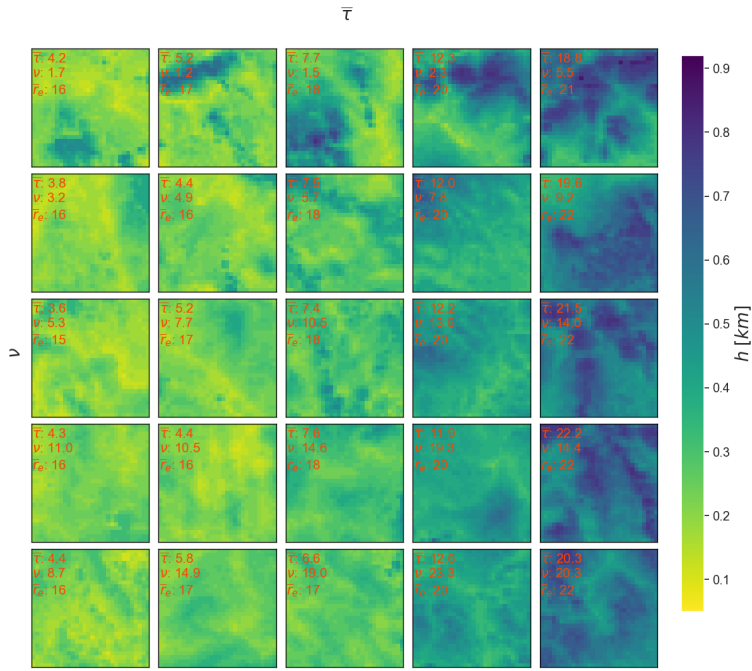


Fig. 9 cloud geometrical thickness $N_d=25$

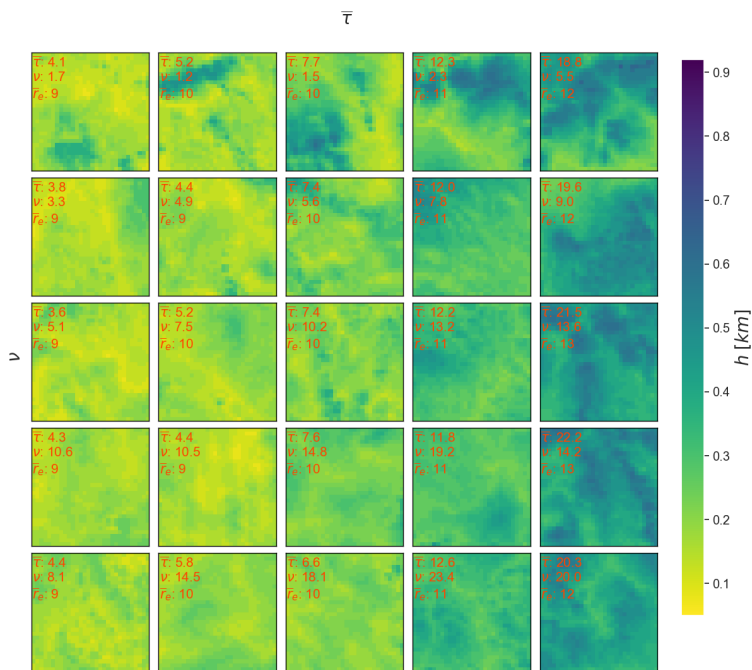


Fig. 10 cloud geometrical thickness $N_d=100$

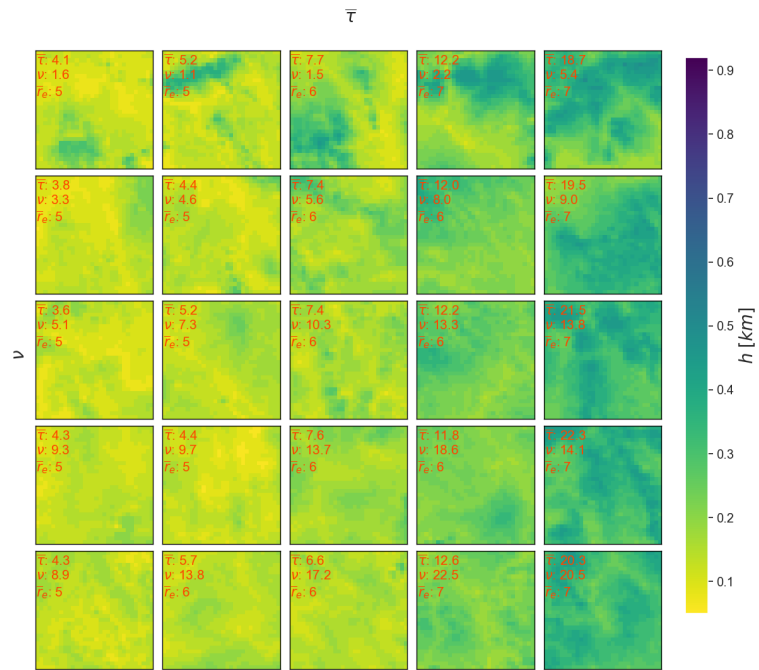


Fig. 11 cloud geometrical thickness $N_d=400$

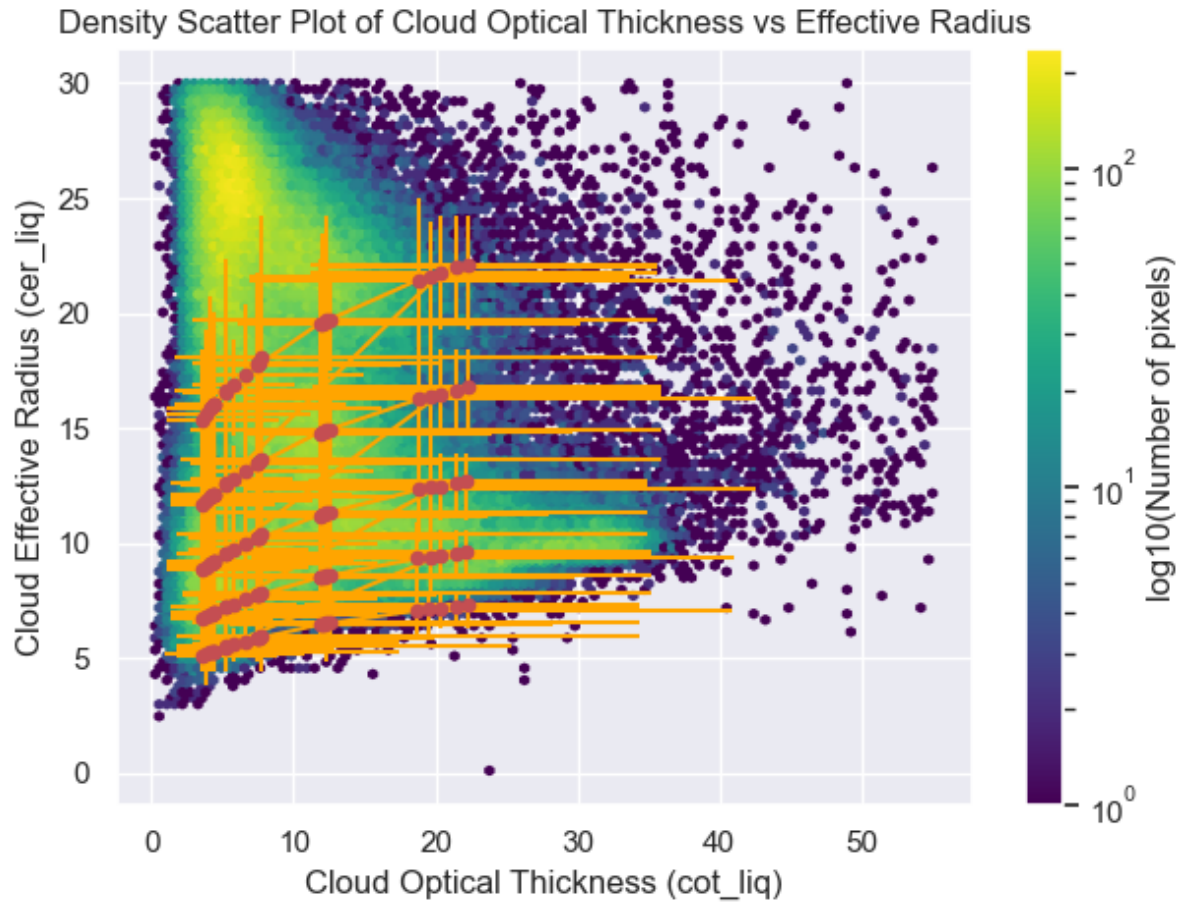


Fig. 12 Global density plot of mean liquid cloud optical thickness against mean cloud effective radius for May 2007 based on ESA CCI dataset (<https://climate.esa.int/en/projects/cloud/>) and the range of optical thicknesses and effective radii used for the semi-physical approach in red dots. And the range of cot and reff within the corresponding scene in orange.