

This thesis aims at the neutrino oscillations phenomena and the role of longbaseline neutrino oscillation experiments and NOvA in particular in oscillation parameters search. The standard formalism of 3 neutrinos model is described, NOvA experiment and its main features and physics goals (mixing angles  $\theta_{13}$  and  $\theta_{23}$ , CP violation, the value of the CP phase  $\delta$  and mass hierarchy determination) are introduced. The effects of media to neutrino propagation are explained and effective matter oscillation parameters are derived. The way to resolve the mass hierarchy exploiting matter effects in long-baseline neutrino oscillation experiments is depicted and consequent problems regarding the recent knowledge of oscillation parameters, i.e.  $\delta$ -,  $\theta_{13}$ - and  $\theta_{23}$ -degeneracies, are discussed. In the last part GLOBES software is used to simulate NOvA results and to compute the estimated sensitivities to the mass hierarchy in case of 3 years  $\nu$  run and 1.5 $\nu$ +1.5 $\bar{\nu}$  years run in order to show the advantage of an earlier switch to antineutrino mode in mass hierarchy determination.