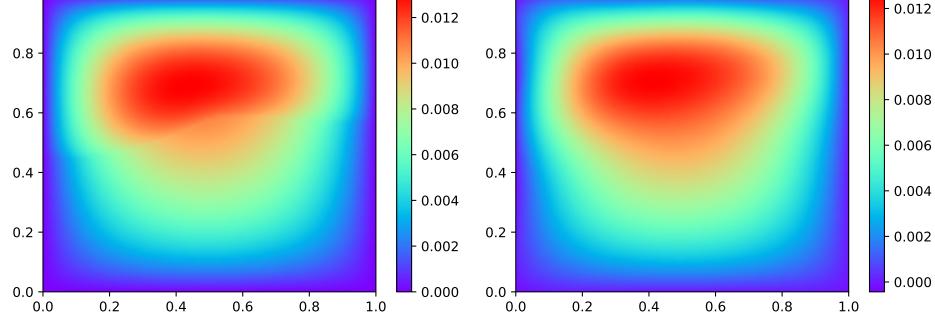case index = 0, rel err = 0.0247