Albeit a small fraction in the total vehicle population, heavy-duty trucks (HDTs) contribute disproportionately to carbon dioxide, oxides of nitrogen, and particulate matter emissions from transportation sector in the United State. The development of accurate HDT emissions inventory requires a proper measurement of their emission factors and a thorough reckoning of their activity. HDT travel activity needs to be characterized by travel speed as HDT emission factors vary greatly at different speeds. However, this has not been done adequately in the past as data source for truck speed is limited.

This research aims at improving data and methods for developing HDT emissions inventory. A statistical methodology for estimating truck traffic speed is developed and validated using data from multiple traffic monitoring systems currently in use in California. The methodology is then applied to freeways in the Southern California region. After that, the estimated truck traffic speeds are used in conjunction with estimated truck volumes to create regional truck activity data in the form of vehicle miles traveled (VMT) distribution by speed bins. Lastly, the regional truck activity data is combined with truck emission factors to develop emissions inventory of HDTs. The results show that the amount of VMT at high speeds (greater than 65 mph) for truck traffic is significant lower than that for the overall traffic (9% versus 54%). Misrepresenting the VMT-speed distribution of truck traffic by that of the overall traffic could result in an overestimate of HDT carbon dioxide emission by approximately 400 metric tons per day.