

## Estimation of Kazakhstan Steppe Fire CO<sub>2</sub> Emission by EOS MODIS

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Kazakhstan has huge areas in dry steppe, steppe and forest-steppe zones. Steppe fires are typical occurrences during spring and autumn seasons. In springtime it is mainly fires on agricultural fields. In such a way farmers are released from last year's preventing to crop sowing stubble and straw. In autumn time it is pasture and nature fires. In the dry autumn period fires are the cheapest way to clear pastures from the old grass and to provide their high quality in the next year. Sometimes pasture fires are distributed to wild-growing grasses grasping the huge areas up to 20-40 %. The volume of combustible organic matter is useful for estimation of CO<sub>2</sub> emission volume from Kazakhstan territory. It is important as understanding of CO<sub>2</sub> total balance before Kyoto protocol ratification by Kazakhstan government. Estimation of CO<sub>2</sub> emission volume is based on two moments. At first it is estimation of burnt areas. Secondly it is evaluation of burnt areas productivity. Pastures and natural grasses burnt areas mapping is carried out most effectively by TERRA/MODIS winter images (1,2 bands with 250 m resolution). In this period the small snow cover divides precisely territories with and without grass. The characteristic form of fire-sites allows to distinguish them easily and to map. Mapping of burnt places on agricultural fields, which are used basically (90-95%) for spring crop growth is carried out inside crop mask. This mask was built by TERRA/MODIS data. Productivity of burned areas (centner per hectare of dry organic material) was estimated within the framework of the certain simplifications. It was supposed, that vegetation architectonics in sense of relation between a projective covering and dry biomass weight, corresponds to wheat. All wheat parameters are well investigated. Average dry weight of grain is equal to dry weight of straw. Therefore the dependence connecting spectral characteristics with wheat yield may be used and for burned areas productivity estimation. Thus, the maximal values of the vegetative indexes fixed during a vegetative season on territories of burned pastures or natural grasses determine burned organic material volume. Agricultural fields shared on two classes - with completely left and taken out stubble. At burning out fields with stubble was considered, that stubble was about 15 % from straw biomass. Thus, the volume of the burned down organic material and CO<sub>2</sub> emission in Kazakhstan steppe zone is estimated. In wet years with high biomass productivity the volume of CO<sub>2</sub> emission exceeds 10 million tons.