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Stroke occurrence in the Augsburg region (Southern Germany) related to air masses and weather types

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Stroke is one of the leading causes of death and disability worldwide and has substantial medical, public health and economic impacts. Life quality of patients who suffered a stroke often is strongly affected due to a poor outcome including re-hospitalisation, recurrent events, depressions, fatigue and more, affected people often require long-term care. In Germany the highest health-care costs result from cardiovascular diseases and amongst them from strokes. Thus not only from a medical but also from an economical point of view, it is of particular importance to prevent this disease as well as to improve the recovery of the affected persons.
Beside well-established primary risk factors (e.g. hypertension, cigarette smoking) an association with meteorological parameters (e.g. ambient air temperature, humidity, air pressure) is assumed in particular with regard to the observed seasonal variations in the occurrence and frequency of strokes or stroke subtypes.
In this contribution we apply an air mass classification determined for Augsburg to stroke occurrences in the Augsburg region during the period 2006 to 2016 (around 18.000 cases). Relative excess morbidities are estimated for each of the seven air mass types, considering different types of strokes (i.e. ischemic, hemorrhagic) and separately for the four three-month seasons (DJF, MAM, JJA, SON). Statistical significance of excess morbidities is estimated with a one sample t-test and additionally the stroke relevance of each air mass is quantified via the calculation of specific occurrence ratios.
This way, we identify air mass types featuring increased relative excess morbidity of stroke and stroke types. For instance, in winter air mass types DT (dry tropical) and MT (moist tropical) exhibit increased relative excess morbidity for ischemic stroke, whereas in summer in particular air mass types DP (dry polar) and TR (transitional) are related to higher excess morbidities. However, in most cases increased relative excess morbidities do not reach statistical significance. Extending the analysis by estimating relative excess morbidities for two-day sequences of air mass types we find statistically significant increased excess morbidities for two-day sequences of MT (moist tropical) and significantly decreased excess morbidities for two-day sequences of DM (dry moderate) in winter.
In our contribution we present and discuss our investigations on the relations between air masses and stroke occurrence and provide an outlook on further advanced analyses utilizing objectively derived weather types to characterize the synergetic stroke-relevant weather effects.