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Land use and urban morphology parameters for Vienna required for initialisation of the urban canopy model TEB derived via the concept of "local climate zones"

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Urban settlements are generally known for their high fractions of impermeable surfaces, large heat capacity and low humidity compared to rural areas which results in the well known phenomena of urban heat islands. The urbanized areas are growing which can amplify the intensity and frequency of situations with heat stress.
The distribution of the urban heat island is not uniform though, because the urban environment is highly diverse regarding its morphology as building heights, building contiguity and configuration of open spaces and trees vary, which cause changes in the aerodynamic resistance for heat transfers and drag coefficients for momentum. Furthermore cities are characterized by highly variable physical surface properties as albedo, emissivity, heat capacity and thermal conductivity. The distribution of the urban heat island is influenced by these morphological and physical parameters as well as the distribution of unsealed soil and vegetation. These aspects influence the urban climate on micro- and mesoscale.
For larger Vienna high resolution vector and raster geodatasets were processed to derive land use surface fractions and building morphology parameters on block scale following the methodology of Cordeau (2016). A dataset of building age and typology was cross checked and extended using satellite visual and thermal bands and linked to a database joining building age and typology with typical physical building parameters obtained from different studies (Berger et al. 2012 and Amtmann M and Altmann-Mavaddat N (2014)) and the OIB (Österreichisches Institut für Bautechnik). Using dominant parameters obtained using this high resolution mainly ground based data sets (building height, built area fraction, unsealed fraction, sky view factor) a local climate zone classification was produced using an algorithm. The threshold values were chosen according to Stewart and Oke (2012). This approach is compared to results obtained with the methodology of Bechtel et al. (2015) which is based on machine learning algorithms depending on satellite imagery and expert knowledge. The data on urban land use and morphology are used for initialisation of the town energy balance scheme TEB, but are also useful for other urban canopy models or studies related to urban planning or modelling of the urban system.
The sensitivity of canyon air and surface temperatures, air specific humidity and horizontal wind simulated by the town energy balance scheme TEB (Masson, 2000) regarding the dominant parameters within the range determined for the present urban structure of Vienna and the expected changes (MA 18 (2011, 2014a+b), PGO (2011), Amtmann M and Altmann-Mavaddat N (2014)) was calculated for different land cover zones.
While the buildings heights have a standard deviation of 3.2m which is 15% of the maximum average building height of one block the built and unsealed surface fraction vary stronger with around 30% standard deviation. The pre 1919 structure of Vienna is rather uniform and easier to describe, the later building structure is more diverse regarding morphological as well as physical building parameters. Therefore largest uncertainties are possible at the urban rims where also the highest development is expected. The analysis will be focused on these areas.

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