cityclim.eu | Factsheet

Technical Backround of CityCLIM

RAVEN

Technical Details

Remote Airborne Variable Emissivity and Temperature Sensor

cityCLIM

What is CityClim?

CityCLIM is a European Union-funded project designed to develop an open platform for climate information and mitigation services. It integrates data from Earth observation sources, ground measurements, and urban weather prediction models to provide detailed weather forecasts for various European cities. The project acknowledges the significant impact of climate change on urban life, particularly the Urban Heat Island (UHI) effect, and addresses these challenges through mitigation and adaptation strategies.

Generic City Climate Platform (GCCP)

The Generic City Climate Platform (GCCP) is a Software-as-a-Service (SaaS) solution developed as part of the CityCLIM project to provide climate adaptation and mitigation services for cities. **It integrates diverse climate data sources, including ground measurements, airborne and satellite data, to offer an advanced urban weather model.** The platform serves as a one-stop shop for City Climate Services, helping both city administrations and citizens understand, predict, and respond to climate-related challenges.

Services
- **Citizen Climate Knowledge Services (CCKS):** A public service that informs, warns, and engages citizens on climate change and extreme weather events, encouraging awareness and adaptation.
- **City Administration Services:** A decision-support tool for city planners and policymakers to analyze, simulate, and implement sustainable urban climate strategies.

INFORM CITIZENS ON CLIMATE CHANGE

WARN CITIZENS ON ARISING HAZARDS

ONE-STOP SHOP FOR CITY CLIMATE SERVICES

SUPPORT MITIGATION & ADAPTATION STRATEGIES

ADVANCED URBAN WEATHER MODEL

ADVANCED URBAN WEATHER MODEL

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HORIZON 2020

RAVEN – Remote Airborne Variable Emissivity and Temperature Sensor

Climate change results in more frequent and more intense heatwaves. This affects urban areas in particular, as they trap the heat and become what is known as Urban Heat Islands. In order to develop effective adaptation strategies, detailed monitoring of heat accumulations in cities and an understanding of their interactions with the environment are essential.The required data can be provided through radiometric Long-Wave Infrared (LWIR) remote sensing. The LWIR range distinguishes itself by not relying on the reflection of radiation from a secondary source for imaging. Instead, it measures the emitted thermal radiation of the objects being imaged, providing a contrast independent of the sun's position and allowing inference of the object's temperature. Using multiple narrow bands, inference about the nature of the emitting surface becomes possible.
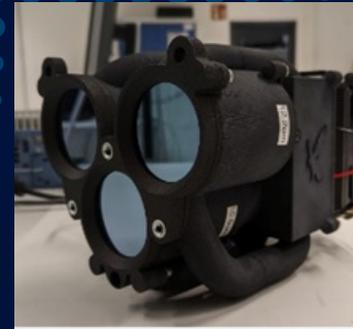
RAVEN sensor

Urban areas exhibit highly heterogeneous surface types that are not adequately addressed by satellite observations or generic broadband LWIR cameras. RAVEN was developed to bridge this gap. RAVEN („Remote Airborne Variable Emissivity and Temperature SeNsor") is an instrument for airborne remote sensing, specifically tailored to the requirements of urban environments and ambient temperatures. RAVEN utilises off-the-shelf hardware to provide high-resolution LWIR images in three calibrated spectral bands. This allows for the simultaneous estimation of surface properties (spectral emissivity) and the corrected surface temperature. The required radiometric accuracy is achieved through a robust calibration approach and an additively manufactured housing with active temperature stabilisation. RAVEN is engineered for use on various airborne platforms and offers a resolution between 0.15 m (100 m altitude / drone) and 4.1 m (3000 m altitude / piloted aircraft).

Land-Surface Temperature measured in the Bremen City Center using RAVEN.
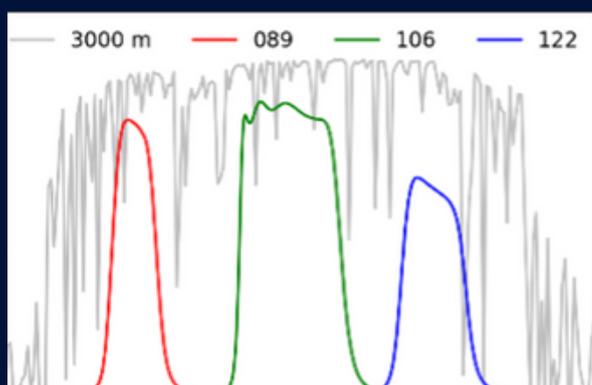
Spectral response of RAVEN

Key Features

- **Heatwaves & Urban Heat Islands:** Climate change increases heatwave intensity, making cities hotter due to heat retention.

- **Need for High-Resolution Monitoring:** Detailed heat accumulation data is crucial for developing effective adaptation strategies.

- **LWIR Remote Sensing:** Measures emitted thermal radiation instead of reflected light, providing temperature data regardless of sunlight.

- **Challenges with Traditional Methods:** Satellites and generic LWIR cameras lack the resolution needed for complex urban environments.

- **RAVEN Sensor:** Designed for airborne remote sensing to capture high-resolution thermal images tailored to urban climate studies.

- **Advanced Calibration & Accuracy:** Uses multiple spectral bands to estimate surface properties and correct surface temperature readings.

- **Versatile Deployment: Compatible with drones and piloted aircraft, offering resolutions from 0.15m (drones) to 4.1m (aircraft) depending on altitude.**