



IEA PVPS Task 16 Parallel Event



Solar resource for cities (solar cadastres)

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Milan, 27 September 2022



PSL



The rationale behind solar in cities



People



Services



Electrical
Demand



Available surface



Modular and adaptable
technology



Solar
electricity

What it means now in 2022



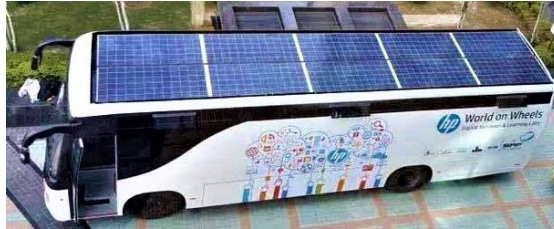
Renewed expectations for urban PV

100 European cities take up the challenge to become carbon neutral by 2030

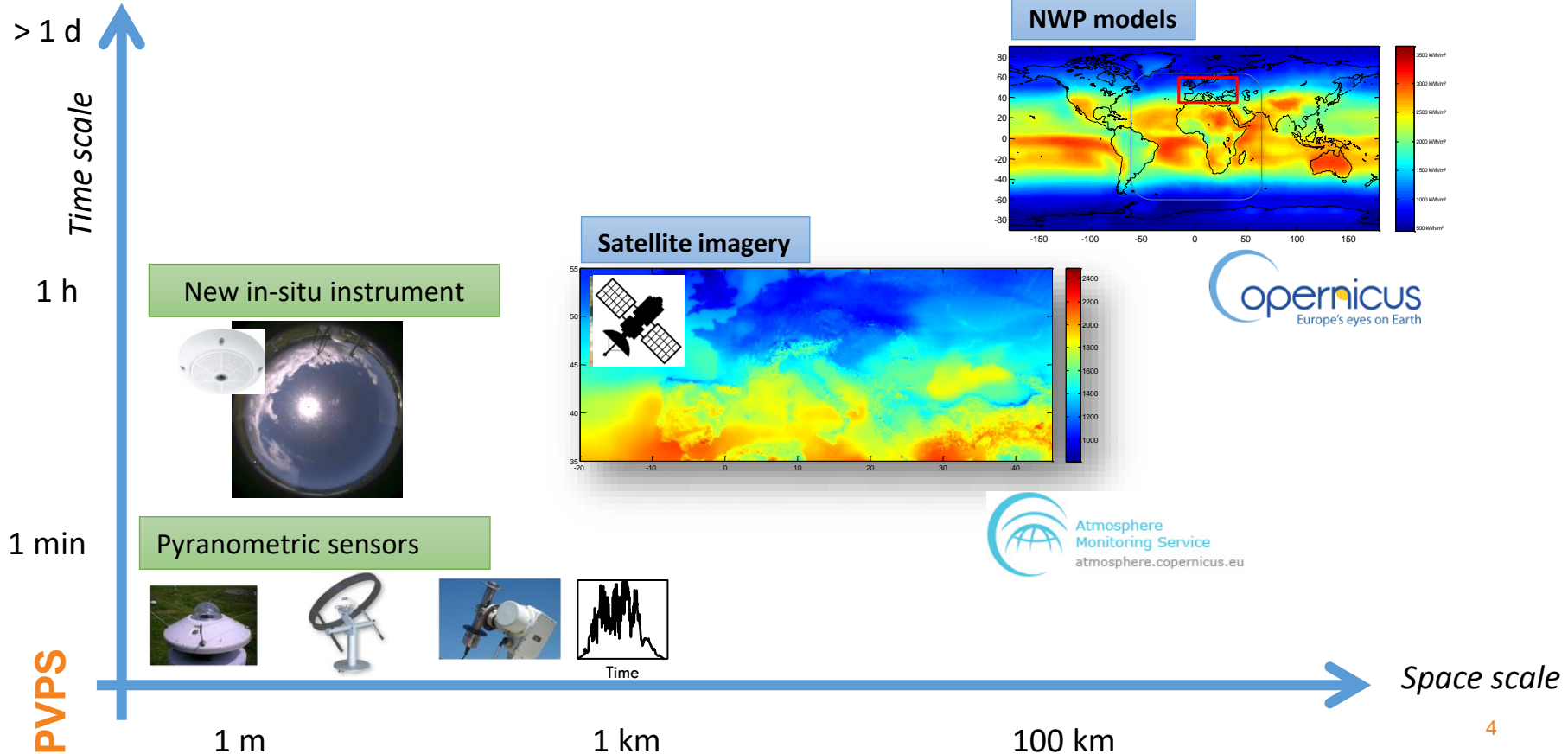
⚡ IN THE NEWS | 15 JUN 2022

Wide-scale use of solar technology in cities would almost cover their full energy needs

by Alexandru Micu — November 11, 2021 in Environment, News, Renewable Energy, Science



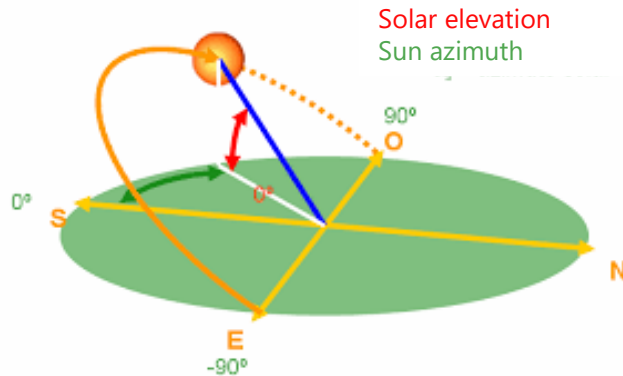
Data to evaluate solar in cities - atmosphere



Data to evaluate solar in cities - atmosphere



It's more than just looking at

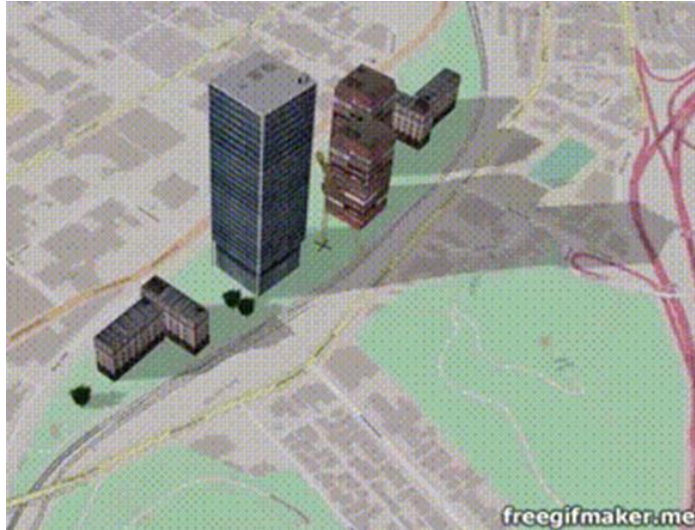


Sun apparent position



Aerosols, water vapour, ozone

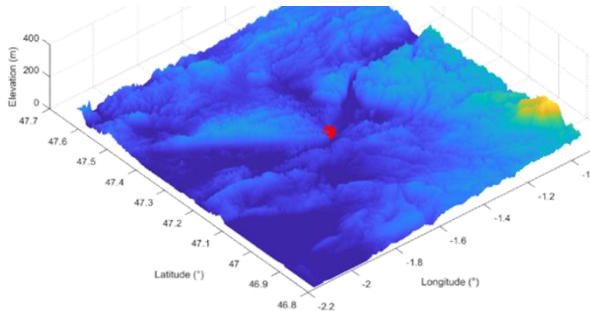
Shadowing, or “what can’t we avoid in cities?”



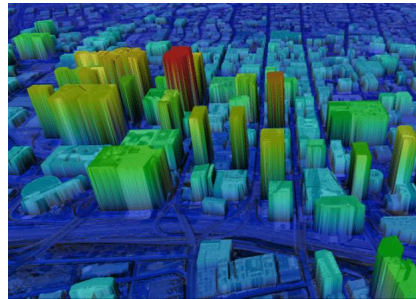
Source: YouTube video from ArcGIS



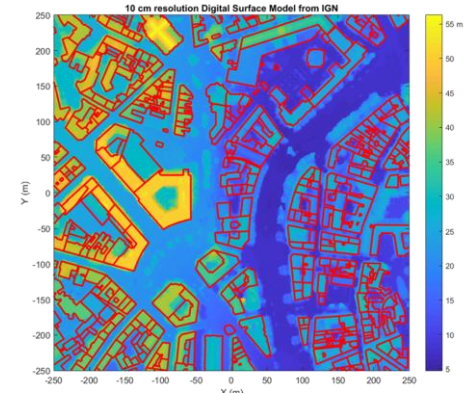
Data to evaluate solar in cities - shadowing



Digital Terrain Models



Digital Surface Models



Building Cadasters

Old times, traditional solutions



Static solar cadasters: until not so long ago, the greatest thing to have



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MINES ParisTech | PSL

SODa solar radiation data

Old times, traditional solutions



Reality is more **dynamic** than a static image



Source: YouTube video from ArcGIS

Old times, traditional solutions



Static and limited information (e.g., annual sum for a typical year)

Driven by technical constraints



Heavy
computation



Lots of data

But was sufficient when PV was still shy and Feed-in-Tariffs “ruled the world”

Work developed in our group



Growing PV penetration and new business models demand more and faster information

Shifting from **static** to **dynamic** cadasters



Work developed in our group



Growing PV penetration and new business models demand more and faster information

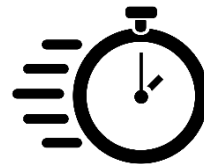
Shifting from **static** to **dynamic** cadasters



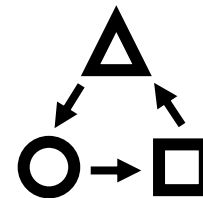
cloud-based



scalable



On demand
On time



Inter-operable

New times, new solutions!



4 years (2019-2023)

60 partners, 7 showcases

Promote use of Earth Observation data

Based on co-designed demo pilots

<https://e-shape.eu/>

Work developed in e-shape project



Pilot 3.2 “High PV penetration in urban area”

Partners:

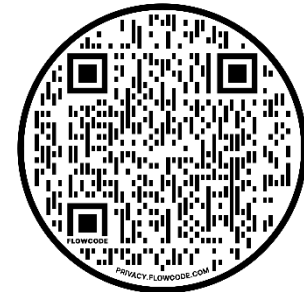


Integrating our shadowing module in:

- Self-consumption simulator
- Solar forecasting service
- Urban planning tool
- ...



Our e-shape outputs
(papers, ppts, posters)



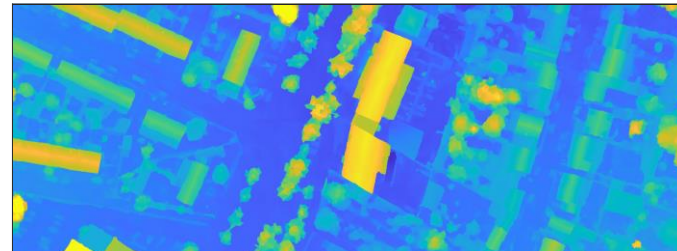
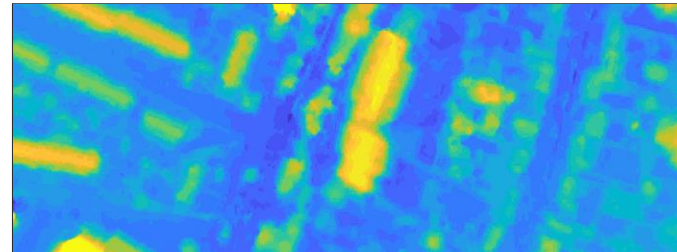
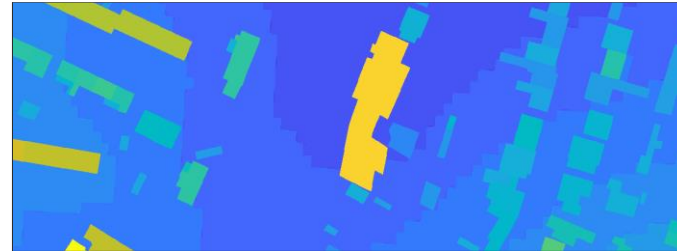
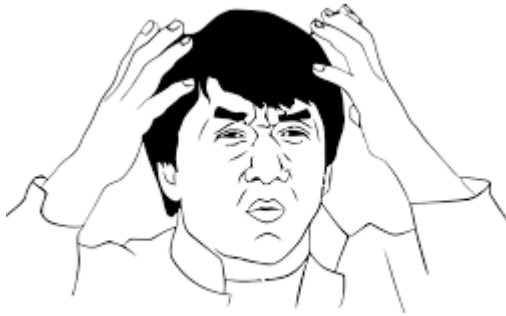
Video recording of a demo
(self-consumption use-case)

Some concluding self-promotion



Will be by poster 4BV.4.27 in 15 mins

- Rise in DSM sources
- Same area, different information
- What gives?!



Solar power to the cities !

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philippe.blanc@minesparis.psl.eu (Philippe)

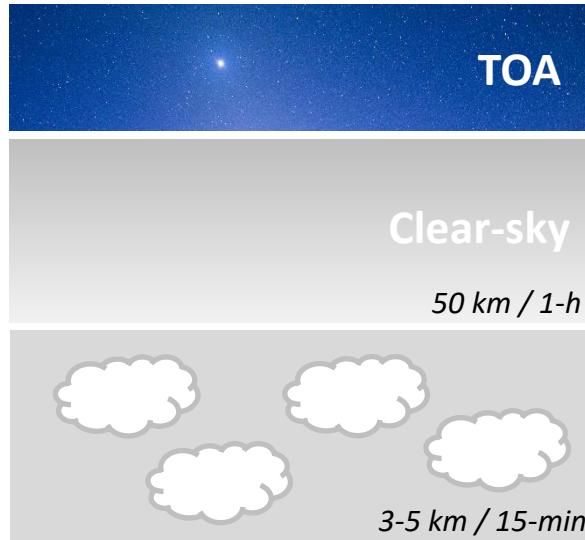
IEA PVPS Task 16



Extra slides



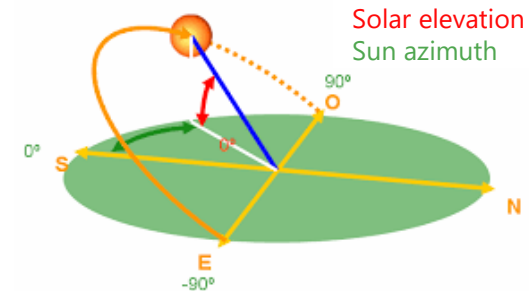
Data to evaluate solar in cities - atmosphere



Solar constant = $1361 \text{ W.m}^{-2} *$

Earth-Sun distance

Sun apparent position**

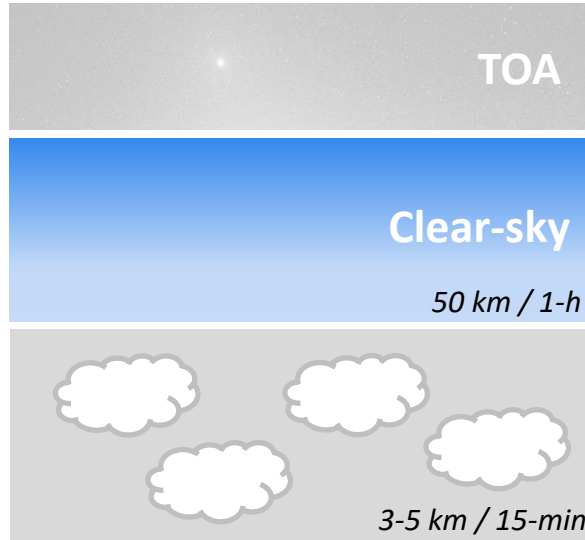


*Gueymard (2018), doi: 10.1016/j.solener.2018.04.001

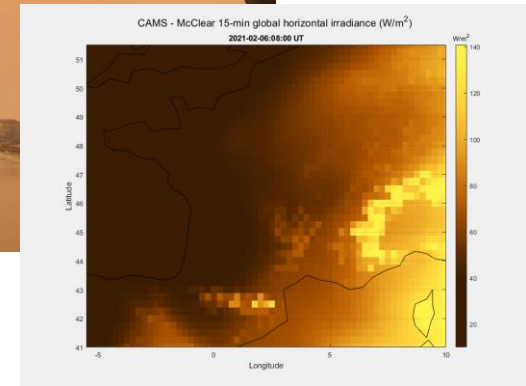
** Blanc et al. (2012), doi: 10.1016/j.solener.2012.07.018

Right figure adapted from "Guia da Energia Solar – Concurso Solar Padre Himalaya"

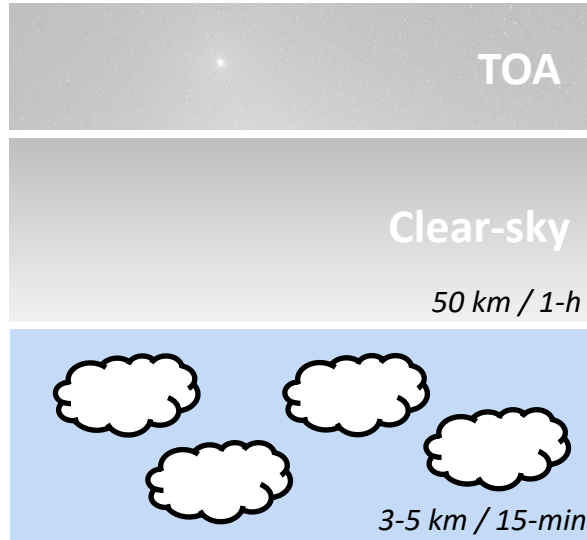
Data to evaluate solar in cities - atmosphere



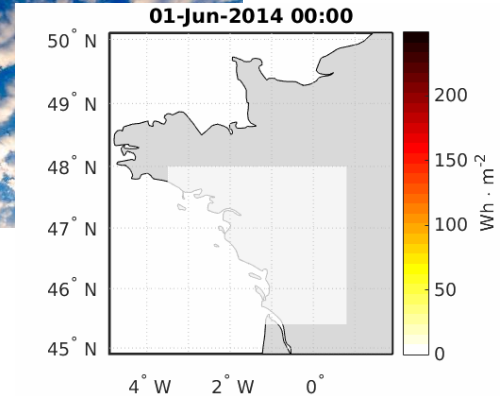
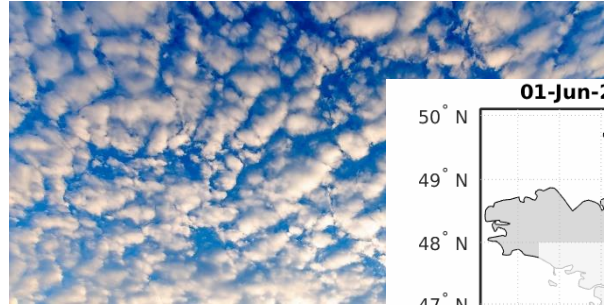
Aerosols, water vapour, ozone



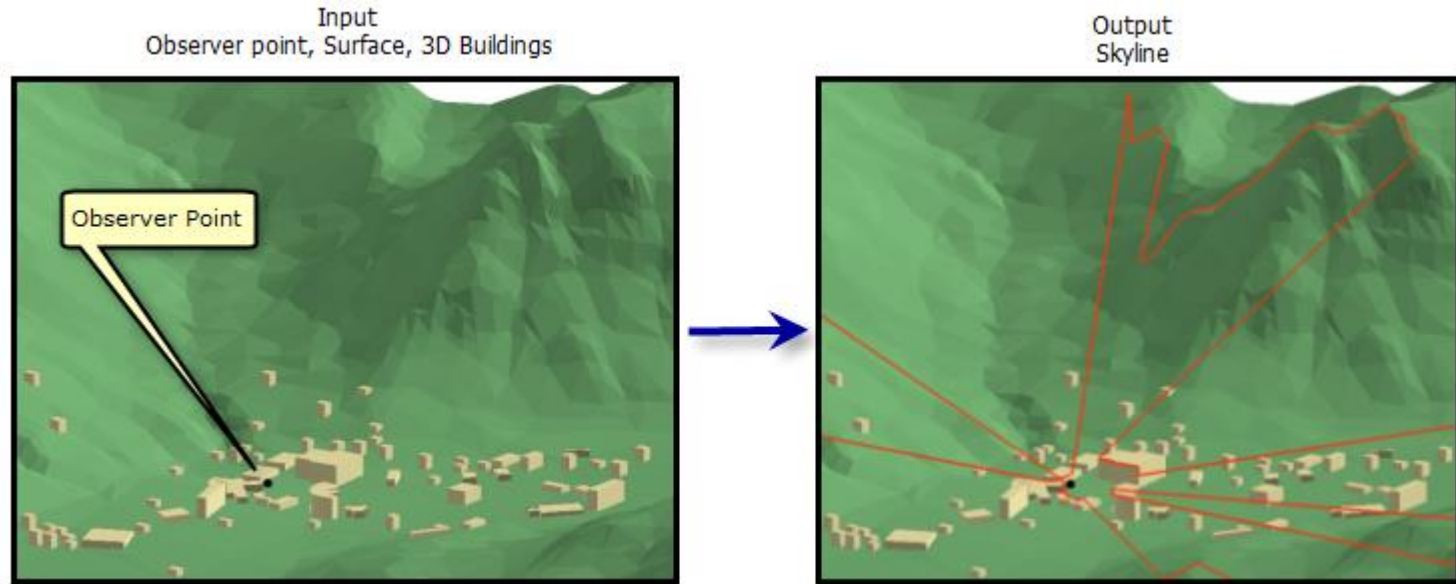
Data to evaluate solar in cities - atmosphere



Clouds

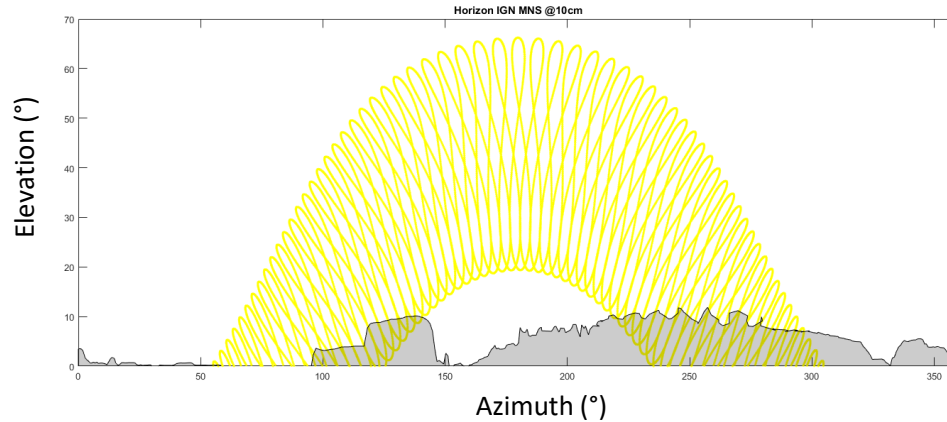


Data to evaluate solar in cities - shadowing



Mapping the surrounding horizon for each pixel
(both from terrain and urban orography – DEM and DSM)

Data to evaluate solar in cities - shadowing



Horizon profile* (gray filled polygon) superimposed
with the annual Sun path (yellow dots)