AUTHORS
F. DÍAZ
G. MONTERO
J.M. ESCOBAR
E. RODRÍGUEZ
R. MONTENEGRO

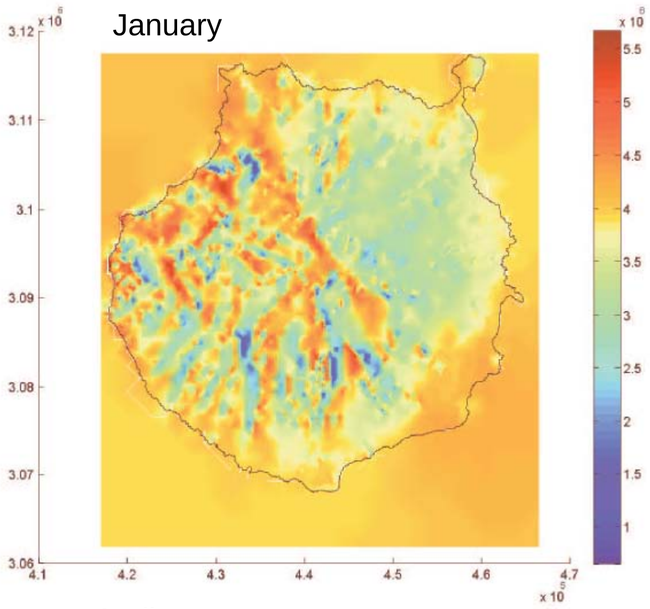
PHOTOVOLTAIC POWER ESTIMATION TOOL USING A SOLAR RADIATION NUMERICAL MODEL

SIANI
INSTITUTO UNIVERSITARIO INGENIERIA COMPUTACIONAL

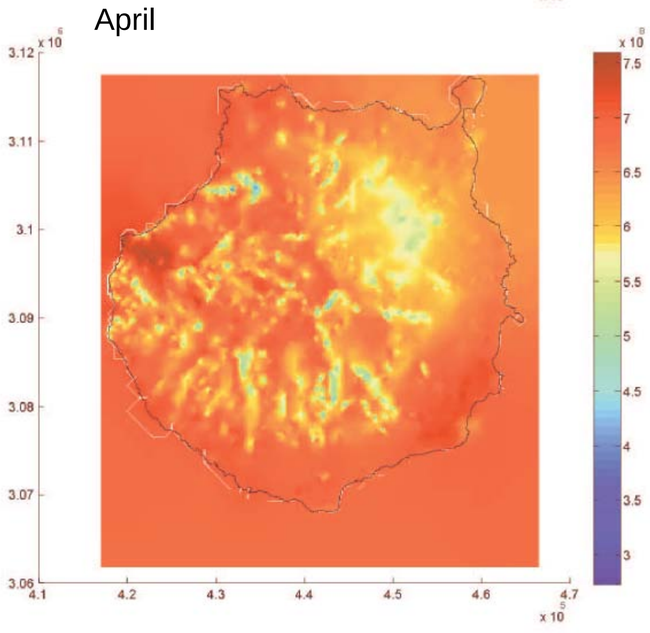
UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA

SOLAR RADIATION RESULTS FOR GRAN CANARIA ISLAND

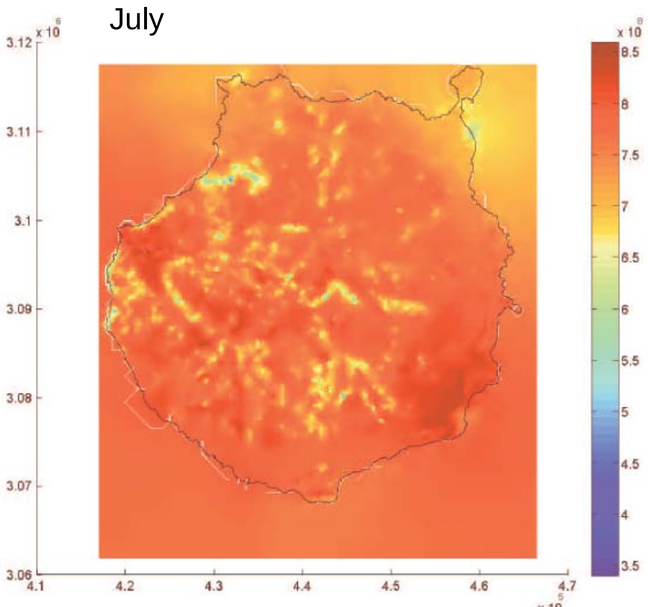
January



April



July



October

INTERACTION RADIATION – EARTH

1. Earth's geometry, revolution and rotation
2. Terrain (elevation, albedo, surface inclination and orientation, shadows)
1. Atmospheric attenuation

SOLAR RADIATION MODELLING

- Adaptive meshes for surface discretization
- New method for detecting the shadows over each triangle of the surface

SOLAR RADIATION CALCULATION FOR ALL THE MESH, ASSUMING CLEAR SKY CONDITIONS

$$G_0 = I_0\epsilon$$

$$G_{bc}(\beta) = G_{b0c}L_f \sin\delta_{exp}$$

$$G_{b0c} = G_0\, exp\{-0.8662T_{LK}m\delta_R(m)\}$$

If $h_0 \geq 0.1$ radians

$$G_{dc}(\gamma_N) = G_{dc}(0)\left(F(\gamma_N)(1-K_b) + K_b\frac{\sin\delta_{exp}}{\sin h_0}\right)$$

If $h_0 < 0.1$ radians

$$G_{dc}(\gamma_N) = G_{dc}(0)\left[F(\gamma_N)(1-K_b) + (K_b \sin\gamma_N \cos A_{LN})/(0.1-0.008h_0)\right]$$

$$G_{dc}(0) = G_0T_n(T_{LK})F_d(h_0)$$

$$G_r(\gamma_N) = \rho_g G_c(0) r_g(\gamma_N)$$

$$r_g(\gamma_N) = (1-\cos\gamma_N)/2$$

$$G_c(0) = G_{bc}(0) + G_{dc}(0)$$

Beam

Diffuse

Reflected

Global

CORRECTION OF SOLAR RADIATION USING MEASURED VALUES REAL SKY CONDITIONS

TMY MEASUREMENT STATIONS

$$G(0) = G_c(0)k_c$$

$$k_c = G_s(0)/G_c(0)$$

$$k_c = \varepsilon\frac{\sum_{n=1}^{N}\frac{k_{cn}}{d_n^2}}{\sum_{n=1}^{N}\frac{1}{d_n^2}} + (1-\varepsilon)\frac{\sum_{n=1}^{N}\frac{k_{cn}}{|\Delta h_n|}}{\sum_{n=1}^{N}\frac{1}{|\Delta h_n|}}$$

SOLAR RADIATION MEASUREMENT STATIONS