Overview
Greenhouse gases (primarily carbon dioxide) have rapidly increased over the last century mainly because of massive usage of fossil fuel for energy production; a direct consequence is the increase of average low atmosphere temperature. IPCC (Intergovernmental Panel on Climate Change) 4th assessment report predicts that continued greenhouse gas emissions (current rate) would cause at the end of the 21st century a globally-average surface warming between 1.8 and 4°C.

The only meaningful greenhouse gases reduction attempt is represented by Kyoto Protocol; the emissions reduction fixed by such protocol is however not enough to solve global warming problem. Furthermore, most effective solutions for carbon dioxide capture like chemical absorption processes or physical solvent processes are still too expensive and hard to be realized. An innovative simple proposal for global warming control is here presented which is based on Earth surface albedo enhancing by means of laying reflecting surfaces. The proposal includes an original solution (patent in P.O. 2006 A 0086) between reflecting surfaces extension and corresponding average temperature decrease: furthermore a ratio between greenhouse gases emission, in terms of equivalent carbon dioxide, and reflecting surfaces extension is also introduced. Many solutions for realizing reflecting white surfaces are also proposed like painting, mad and low value areas whitening, floating white island and artificial salt lakes, etc. Furthermore, personal behavior and practices may also help to enhance Earth average values of white island, white clothes, etc. This paper deals with an theoretical and experimental validation of the proposed method. A mathematical model has been proposed and verified by a lab prototype; model and experimental results validate the proposed patented method.

The proposal
Solar energy is absorbed by electromagnetic short wave radiation (0.2 - 4 μm) when energy reaches Earth surface it is splitted into the following contributions:
- 26% of it is absorbed by objects, plants and particles in the atmosphere;
- 19% of it is absorbed by clouds, gases and particles in the atmosphere;
- 55% reaches Earth surface where it is mainly absorbed by the ground and the ocean, warming the planet.

Earth emits (thermal emission) long wave radiation (4 - 25 μm) towards outer space; such radiation is partially and normally shielded by atmosphere; however, shielding is enhanced by high concentration of greenhouse gases: CO2 produces Earth surface temperature increase. In the proposed technology, shortwave energy reflection by Earth surface is improved in order to dim the warming energy.

The mathematical model
An innovative mathematical model is proposed which evaluates the relation between albedo and global temperature. Figure 2 represents a scheme of radiative exchange among Earth surface, atmosphere and outer space which is based on two energy balances separately carried out on visible and infrared spectrum: an eight equation model is obtained.

Known data: $w_1$, $q_1$, $T_2$, $r_2$, $r_3$, $\alpha_1 = \Delta \alpha$, $\alpha_2 = \Delta \alpha$, $\alpha_3$, $\alpha_4$, $\alpha_5$, $\alpha_6$, $\alpha_7$, $\alpha_8$.

Unknown data: $w_2$, $w_3$, $q_2$, $q_3$, $T_3$, $r_3$, $\tau_3$, $\rho_3$.

The following hypothesis are assumed:
- Earth temperature reduction of 0.6°C (equal to the last 50 years increase);
- Usage of surface with titanium dioxide $\alpha_3 < 0.01$;
- CO2 released in atmospheres in the last 50 years = 1100 billions of tons;
- CO2 adsorbed by oceans and biophases = 631 billions of tons;
- CO2 concentration increase in the last 50 years = 469 billions of tons;
- Solar average radiation = 342 W/m². Under the previous hypothesis, the model allows to evaluate the temperature increase due to emission of greenhouse gases in the last 50 years. (Table 1): the total surface needed to compensate the temperature increase due to emission of greenhouse gases in the last 50 years is the same as the total surface in whichreshining surface which compensates the temperature increase produced by 1 ton of CO2.

Experimental validation
Mathematical models have been experimentally proved (CIRAF Congress proceedings march 2007) by means of a lab prototype. It reproduces heat exchange among Sun, Universe and Earth. Figure 3 shows the prototype: two concentric domes lay on an insulating Teflon plate. Inside the inner dome a spherical cap replaces the Earth surface. An array of temperature sensors and thermometers has been installed on the Earth surface. Vacuum is made inside inner dome to only radiative heat exchanges. Vacuum inside inner dome is made by a vacuum pump. CO2 fills the space between the two domes to avoid frost formation. Vacuum inside inner dome is made by a vacuum pump. CO2 fills the space between the two domes to avoid frost formation. An heat exchanger keeps CO2 temperature at -35°C. High pressure suction lance illuminates the Earth-like surface passing through the two domes. A measurement campaign allowed to determine the relation between Earth-like surface temperature and albedo for different irradiation conditions. Results show that:

- $T = 0.38 K$
- $\Delta T = 0.04 K$

This result agrees with the one obtained by the mathematical model for the average solar irradiation.

Large scale application

1. Roof Whitening: whitening of industrial sheds (40% of total of the Italian objectives for the Kyoto Protocol); whitening of the Italian main highways (enough to reach 50% of the Italian objectives for the Kyoto Protocol).

Examinations
Viaduct Langhirano Highway.
- Dimensions: 4000 m;
- new starting up of salt-working sites in low valuable areas (reaching 10% of the model allows to evaluate the painting performance in terms of global warming reduction is realized. As the surfaces are not horizontal, an in-depth study of the painting performance in terms of global warming reduction is realized. As the surfaces are not horizontal, an in-depth study of

Small scale application
Not only national and international actions can be envisaged, but also personal possibilities are also proposed.

- Household energy saving, usage of low energy impact transport systems and renewable sources, energy efficiency, all personal possibilities;
- Besides that, a new chance is available today, making white reflecting surfaces a serious economic strategy for reducing CO2 emission.

- Infusion, granulometry dust of calcium carbonate used in garden flowers;

- White reflecting certified surfaces in the garden furniture, umbrellas, tents, beach towels, car painting, etc.

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