ATMOSPHERIC COMPOSITION

The Earth's atmosphere has changed composition at least three times in the history of the Earth, from essentially a high pressure carbon dioxide atmosphere to one high in methane and now to one in which oxygen is high and carbon dioxide and methane are quite low. The atmosphere is the source of all weather and climate changes. A more complete summary of the atmosphere may be found in Appendix B entitled "FACTS ABOUT THE ATMOSPHERE."

Dry Atmosphere Composition---Percent by Volume (Reference 2)

N_2	**78.084**
O_2	**20.946**
ARGON	**.934**
CO_2 *	**.0380**
NEON	**.0018**
HELIUM	**.0005**
METHANE (CH_4) *	**.000174**
NITROGEN OXIDES*	**.000052**
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WATER VAPOR*	**0-4.0% (TYPICALLY ~3%)**

***** Greenhouse Gases

The atmospheric composition is virtually always stated as "dry" because the moisture levels can vary so much.

GREENHOUSE GASES

Greenhouse gases have been totally mischaracterized and misunderstood by the media. Both the media and the International Panel on Climate Change (IPCC) have promulgated the fiction that greenhouse gases are undesirable. Nothing could be further from the truth. (The Supreme Court has even ruled the EPA has the authority to control carbon dioxide levels, as though it were a pollutant.)

Greenhouse gases are vital to the existence of multi-celled life on this planet, for, without these gases, our planet would have a global average temperature of 0^{o}F. That is 32 degrees below freezing!

Greenhouse gases allow transfer of the Earth's heat to the atmosphere to help moderate temperatures around the world and distribute water by precipitation.

Greenhouse gases are truly God's gift to the Earth!

Can you image what the Earth would be like at 32 degrees below freezing! The lakes, the rivers, and the oceans would freeze solid. Without liquid water, no plants or animals could survive. There would be no agriculture, no trees or plants to generate food or convert carbon dioxide into oxygen and water. Our planet would be one large Antarctica, without the penguins, since they require liquid oceans in which to feed.

The Moon, which is essentially the same distance from the Sun as the Earth, experiences daytime temperatures exceeding 253^{o}F and nighttime temperatures as low a -294^{o}F (measured on the moon by Apollo 15.) At the lunar South Pole, where the new US moon base is planned, temperatures in the shaded areas go down to -387^{o}F. These lunar temperature extremes occur because of two factors. First, the lunar day and the lunar night are both 14.75 Earth-days long. This allows greater periods of warming and cooling. Second, the Moon has virtually no atmosphere. Therefore, there are no greenhouse gases to slow the loss of heat from the surface, nor clouds to reflect incoming solar heat. Within 2 hours of sunset, the lunar temperature drops by 200F.

But it is not just the temperature control by greenhouse gases that make the Earth livable, the greenhouse gases, themselves, are the molecules of virtually all life.

Greenhouse Gases---The Molecules of Life

Four major greenhouse gases are water vapor, carbon dioxide, oxides of nitrogen, and methane. They account for over 99.8% of the global warming effect.

Water Water makes up 65% of the human mass and 98.73% of the ten trillion molecules in a typical human being. All plants need water to make carbohydrates, fats, and proteins which are the foods for all animals, and even the plants themselves. In addition, plants create the oxygen animals need to breathe. Without dissolved oxygen in the oceans and oxygen in the atmosphere, multi-celled life would not survive.

Carbon Dioxide Plants cannot use carbon directly, but must use carbon dioxide. Carbon dioxide provides the carbon for all carbohydrates, fats, and proteins. Again, plants make all the food for themselves, as well as other animals (herbivores and carnivores), from carbon dioxide and water.

Oxides of Nitrogen Neither we nor the plants can extract nitrogen from the atmosphere directly. Nitrogen fixing bacteria create oxides of nitrogen which plants can use to make amino acids. Any of twenty two different "essential amino acids" can be combined to make all existing proteins. Proteins comprise 20% of the human mass.

Methane Methane is a by-product of the digestion of food in the absence of oxygen. All organic material which decomposes will decompose either to methane or carbon dioxide. Organic decomposition (eutrification) is the process by which organic matter is recycled.

Greenhouse Gases—Concentration and Effect

Major Greenhouse Gases:

	Concentration%	Greenhouse Effect (%)
Water vapor*	**up to 4%**	**94.5**
Carbon dioxide*	**380 ppm**	**5.0**
Methane	**1.75 ppm**	**0.5**
Nitrous oxide	**0.31 ppm**	**negligible**

***water vapor and CO_2 absorb at some of the same IR frequencies (See Appendix A).**

Greenhouse Gases----Comments

Water *vapor is, by far, the most powerful and important greenhouse gas, accounting for about 95 % of the greenhouse gas temperature effect* (Reference 1). Water vapor arises from the surface (oceans and land) and distributes heat to the upper atmosphere by evaporation, condensation into clouds, and the formation of ice and snow. As previously mentioned, at 78F, >660 calories are delivered to the atmosphere for every gram of water evaporated and frozen into ice. ***Because we can do nothing to control the amount of water evaporated, 95% of global warming is beyond man's reach.***

Not only does water vapor absorb many of the long-wave frequencies typical of the infrared radiation of the atmosphere and the Earth, but it also absorbs major portions of the incoming, short-wave solar radiation. Most of the carbon dioxide absorption is in the 15-micron infrared long-wave band. If water vapor were totally absent, carbon dioxide could absorb in some of the frequency bands as water does. For more details, see Appendix A, Figures 23 and 24.