Тераформиране на Меркурий по Дейвид Семлох:
.....

Форуми (Usenet)
Разширено търсене в групите Настройки

Резултат 62 от търсенето във Форумите на semloh

Брой резултати 62
От:semloh (semloh@ficnet.net)
Относно:Mercury Terraforming Prospectus
Това е единствената публикация в тази нишка
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Дата:1999/05/10

Living on a terraformed Mercury? Impossible !?!

 The Basic Mercury Terraforming Idea Has That transporting volatiles to the world is the only "inexpensive", large-scale method. While my thinking on how and why it would (should/could) be relatively "cheap" is glossed over here, considerable work has been done on just about the only practical way (a periodic comet or asteroid imitator re-directed by gravity assist(s) to become a long-period comet streaming out toward the Ort cloud in a ever so slightly broken apart form from the last gravity assist, for maximum control and correctional ability, to intercept a Plutino in a glancing blow to maximize the dV, with 0.5/sec probably necessary for the 100km sized preferrable object in a reasonable time frame for us impatient humans). And finding via remote sensing probes and instruments an almost purely water/ammonia plutino [amongst the 20,000 or so in a trojan like orbit near Pluto/Charon large enough to do the job] is surely not the in the cards for the near future.

Nor is it confirmed that the dissociation of the atmosphere would be as easy as it appears, though the tables look favorable towards this end (low enough gravity, high enough solar/atmospheric entry temperatures for extremely rapid H2 loss -- before more than 30% has recombined -- to ensure about a 0.3 bar atmosphere with the remainder becoming water in large, polar hugging crater lakes).

But these "trivalities" aside, enormous rewards potentially greet a properly done construction project. The planets (if Uranus is used for a gravity asist) will be in place at earliest in about 50 years and require

about 40 years after that to move towards the inner system. But once that is accomplished, hypothetically, a fresh planet would be transformed rather rapidly. At the first weeks, though this might be stretched out over a longer term as is useful by gradual introduction of the volatiles if possible, the temperatures would be extremely hot, partly by design and partly by necessity. Over the next few years weather patterns would probably stablize much as below indicates, or that is increasingly what models seem to show, possibly allowing the poles to be shirt-sleave environments, especially at 87 degree + latitudes, and certainly encouraging harvestable life as much as a thousand kms outside these boundries. Millions of people could be very comfortably supported and housed with comparably little expense beyond the interplanetary trip and the initial celestial engineering job. And as population grows, building those oft mentioned solar parasols would be a natural next step, albeit an expensive one.

And _that_ is what all my enthusiasm is about. The reader has certainly picked out far too many what ifs for comfortable conjecture. But the fact remains that there exist few if any other alternatives. Mars icecaps and regolith will certainly leak out fatally poisonous C02 levels for millennia to come and other terraformed worlds will lack the insolation to dissociate the water and ammonia to provide a breathable atmosphere, and have a much harder time holding on to the atmosphere with the possible exception of our Moon. Going against intuition, Mercury seems to be an unlikely winner in the worthwhile prospects of space settlement, and it certainly bears further looking into than I am presently individually am doing. In a number of respects, this proposal is no more than at a "back of the envelope" level in a number of places at present.

The reader is also excused if images of this writer seeing one too many Star Trek movies (no offense to Trekies, but actually I almost hated those movies and long ago out grew most of the TV plots) come to mind. Yes, the level of thinking here goes far beyond that kind of fantasy. I do suggest that my idea is one of the only plausible ones in the next 150 years for a breathable atmosphere. But Taylorian World Houses on a smaller polar crater scale is another option for Mercury, though the scale of dissociation alone will be enormous as it must be then done by human manufacturing processes -- if attempted anytime in the next two centuries. If my orientation, mostly not discussed, reviewed, or posted yet, of the viability of transportating the volatiles on a mass scale relatively cheaply and efficiently eventually prove technologically and feasibly correct, then just remember ... you saw it here first .

This previous posting on RemarQ leaves out a key aspect which might cool the planet, the effect of dust which would be very prevelent due to the great winds and the already present talcum powder like cm or so on the surface and greater amount near the surface which would soon be uncovered by the winds.

List of Discussions<Picture: Newer Discussion Topic>DiscussionTopic<Picture: Older Discussion Topic>Reply to This Discussion

Message:1 of 4From:semloh <semloh@ficnet.net>Topic:Mercury Terraforming Post BSent:Mon, 01 Feb 1999 12:30:30 -0800This is a re-written and easier to read version

HEADER _ A Terraforming Project_ HEADER

A TERRAFORMING PROPOSAL

Relating to human settlement on the planet Mercury, there are many seemingly impossible conditions.* Surprisingly, it still may well be the best initial terraforming candidate if acquiring an atmosphere through the commonly suggested gravity assisted iceteroids approach proves viable.

Consider these reasons:

1) Providing that any choice iceteroids are available at favorable orbit periods and only needing a reasonable amount of dV, it is much better to have a totally airless planet because iceteroids offer numerous choices of what elements can be placed on the world. Also, the elements have the potential to be modified partially through solar dissociation processing in a low or highly eliptical orbit -- soon to decay -- in which Mercury beats all other terraforming candidates by a sizable advantage.

2) It has a relatively strong gravity, enough it seems to hold on to an atmosphere of 02 and N2/Ar (.3 bar suggested for greenhousing and respiratory limititions) for enough centuries like a sort of celestial lay away plan until an expensive parasol is slowly (or quickly as technology progresses) built to decrease heat and reduce the loss of volatiles. Though it has a strong gravity for its size (from its massive iron core), it is also physically small++, a fact very helpful for shortening latitudinal air current distance and to moderate the day and night differences in temperature.

3) Weatherwise it is clear that sacrificing the equator is best for the sake of economy, both in start up capital and of quite possibly scarce suitable/timely/and massive iceteroids, and on Mercury it is the only viable option at first.

With dissociation of much of the water and ammonia ice of the iceteroid, a 50%/50% allocation of the mass to air (02/N2) and liquid surface water is possible with little more than a 100 km sized object. (More likely, with the dissociation being not possible or cost effective, is a > 30% rate of water transformed into 02. The extra water should make little difference as

it is impossible for it to migrate far down towards the equator due to regolith heat and wind patterns. In any planet or planetoid with a significant fraction of equatorial regions filled with water, easily 30 times that mass is required. In the case of an un-parasoled Mercury, the greenhouse humidity would destroy

Economy, only allowing for the poles to be habitable, does wonders for budgets as poles only compose about a twentieth of the surface of a planet and yet have a millions of square kilometers of living space, with the permanent water/snowpack area perhaps set to be 4% of Mercury.++ (Water body depth lessening towards lower latitudes because of evaporation.) Every other terrestial planet or moon would have to have far more water, have a dry world with a very dense atmosphere, --

excepting the extremely difficult case of Venus. Equally important for Mercury, H20 is a much stronger greenhouse gas than C02, so the absense of saturated air is well worth the cost of fewer clouds and lower albedo.

Iceteroid Suitability, Availability, and Selection

Going into some detail, suitable plutinos -- David Jewitt extrapolates about 25,000 being 100 km in diameter http://www.ifa.hawaii.edu/users/jewitt/kb.html -- and kuperoids fulfilling all minimum requirements having well rounded characteristics and no more than traces of unwanted gasses like methane are better expected to be very unusual, say a single body or two with present knowledge of the frozen objects.

(Remote sensing of interior compositions will of course have to be advanced greatly and several objects might be dragged into the gravity assist system with the most suitable picked after interior compositions are well know by way of a strategic fly-by Roche limit breakup. The rejects could then be sent to Mars, the Trojans, etc. for alternative use.)

Such slow objects (~40 AU) must have a close trajectory pass in that orbit sub-segment approach (almost all would be in stable resonance and outside the bounds or demand very high dV) for a gravity assist, not have more than trace amounts of C0, C02, or more harmful gasses not easily broken down, have a composition almost wholly of water and ammonia, and be of sufficient size. The time factor of altering the orbit, the longest period in this terraforming project before settlement, would be a critical consideration.

I guess, rashly, that the only practical answer is to search for a Plutino in the group (they act like Trojans) capable of being deflected by gravity assisted now long very long period comet or asteroid of at least (in a retrograde orbit or modified to; broken into a number of pieces from its last pass by for maximum amount of control in a very difficult collision

operation, one with fairly limited vector force compared to the overall kinetic energy), with a dV slowing of .4 km/sec in order to be altered into a orbital period like Saturn's (rotation every 30 years), or much more desirably a .6 km/sec to ensure quicker intercept time for impatient Earthlings on a timetable.

From there, it would be gravity assisted by Uranus (or, improbably, Neptune or Saturn) to the rest of the solar system. Further information on the subject, as I am familiar with it, is available upon request, but confessed ignorance of what actually possible in this field of celestial mechanics is readily given. A comet life projecting astronomer or celestial would be able to say how viable this is with few passes of the gas giants and exactly how long it would take. A comet like orbit is by far preferrable (the Pioneer/Voyager type of fly-by is faster but goes on a curved path so takes longer to intercept). A retrograde orbit is also considered to be a plus even if a glancing impact of very low degree angle proves to be unworkable.

And what about Mars?

Mars almost certainly has enough volatiles, but heating up significant amounts would be a problem involving hundreds of well guided asteroid strikes or extremely costly subterranean thermonuclear blasts and the atmosphere would not be breathable for a very long time, the eons long C02 outgassing then being in far too high concentrations for plants as well. A lesser condition, initially, exists with an iceteroid atmosphere delivered, but only somewhat. The great icecaps could then be sealed with a layer of ice. Still, the iceteroid requirements would be at least 30 times that of Mercury, with only a few viable areas and a steady loss to the caps. And no easy way exists to create an 02 atmosphere.These considerations are enough to turn to Mercury for a second look, as Mercury could become breathable and have outdoor crops (at least under UV inhibiting plastic) and fisheries within a mere decade if my outline of H20 dissociation contain any merit.

The Poles Revisited

Would the water really collect only at the poles?

In an iceteroid scenario, quickly almost all water would naturally be deposited at or near the poles in a few years time, with "day" temperatures being so fierce at the lower latitudes. It is logical. At the poles the insolation is low and for dozens of kilometers below it shows -- average crater bottom temperatures presently are less than

should have areas which never rise above about 102 K (4) and that even flat surfaces at the poles would not exceed about 167 K (5).**

Slade, M. A., Butler, B. J., and Muhleman, D. O. ``Mercury Radar Imaging: Evidence For Polar Ice." Science 258, 635-640, 1992.

in accepted models of an airless environment with almost nil axis tilt at that AU, albedo, etc. Now, much of the regolithic temperature could be

overrun by creeping heat when atmosphere is introduced, but the combined effects of a highly likely dominant east-west wind systems more like that on the gas giants would insulate the poles from most of the worst extremes.

And the heat from the equator? Models exist involving very slowly rotating worlds without appreciable coriolis effect (one apparently done in MIT) suggesting latitudinal winds would be so strong that the temperature differential between day and night be greatly lessened.

Moreover, it seems the amount of longitudinal heat transfer gets inhibited. This is very important to keeping the poles cool. In conjunction, the circumpolar winds only have 1200 kms to travel from midnight to noon.

David Semloh

*3 month long winters with no sun, some twilight; extreme solar storm exposure with a weak magnetic field; hard to get to location in the solar system, especially by gravity assists when slinging a huge iceteroid; a 184 Celsius average present regolith temperature; the probable rapid oxidation of the regolith; greenhousing dangers, and the list goes on. But none are insurmountable, nor is the idea of
economy.

++ Mercury is a pretty small object with corresponding sq. km. ; It has about twice the surface area of the moon but only an eighth of the Earth's surface area and half that of Mars. This would miminize iceteroid requirements further, about to a ratio of 1:150 for an economical Mercury to an oceanic (and very unlikely any time soon) Venus terraforming project.

** Temperatures quickly rise in decreasing lattitudes as soon as the sunlight penetrates even briefly into the bottoms, except with smaller craters (which have
relatively higher inclination depths for being shaded continuously, but receive more wall IR). Within small craters regolith bottoms are ~ 0 Celsius down to the 50th latitude presently.

This is useful for settlements as it easily allows sizable, permanent bodies of water (a few km across) to collect down in the 50 to 60 degree range, helping
moderate peak temperatures with the reservoir heat aspects and ground effect of cold sinking (so the body does not dry up easily, not lasting to peak periods). While not suitable for humans in most senses of the word and lakes would be but a few percent of the land, these latitudes could provide an additional buffer
from equatorial heat transfers.

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Message:2 of 4From:Nicholas Landau <nlandau@eden.rutgers.edu>Topic:Re: Mercury Terraforming Post BSent:15 Feb 1999 19:46:35 -0500semloh@ficnet.net (semloh) writes:

Key:
< (my earlier post)
 Bold Nicholas Landau
nothing D. Semloh's reply

>Moreover, it seems the amount of longitudinal heat transfer gets inhibited. This is very important to keeping the >poles cool. In conjunction, the circumpolar winds only have 1200 kms to travel from midnight to noon.

Let me get this straight: with no coriolis effect, the winds will *not* blow from equator to pole? Are you sure that you don't have this backwards?

Winds here are driven by the temperature gradient between the equator and the poles (a gradient which will be *much much* more powerful on Mercury). The coriolis effect is the cause of circulation cells and the resulting E/W winds all over the world. The introductory lecture of Atmosphere and Weather included the professor's assertion that, without the coriolis effect, the world would have only two circulation cells: the Northern Hemisphere and the Southern hemisphere.

The gas giants mentioned in the post have extremely powerful coriolis effects, and so have powerful circulation along lines of latitude.

The whole notion that the circulation along longitutidal lines would be weak seems contrary to intuition and it is also very central to your assertions that Mercury would make a nice place to live. Based on intuition and a little knowledge, I would assume that a powerful convection cell would have its center at the Mercurial equator, at which point the atmosphere would rise causing an atmospheric convergence.

Circulation would thus run from pole to equator. Actually, that is good news in terms of temperature balance, because that means that (relatively) cold air from the upper atmosphere would be sinking at the poles. However, its bad news for moisture balance because the moisture at the poles (where I assume 100% of the liquid water will be found) will be transported to the equator. It will not re-precipitate along the way.

Hmmm...actually, that depends. As the air rises at the equator, it will cool. For all I know, it will cool enough to form clouds at high altitude. This would be good albedo medicine.

Well, in any case, the process by which high-altitude air is dried here on Earth (the precipitation of the moisture as the air rises in convergence zones) will not be present...if the water precipitates from the clouds, it will evaporate again as it falls to Mercury's searing equator.

Well, getting back to my original point, how in creation do you explain no cross-latitudinal winds in world without a Coriolis effect? You haven't explained this at all so far as I have read, only cited others. It sounds awfully wrong, and it is very important.

Message:3 of 4From:semloh <semloh@ficnet.net>Topic:Re: Mercury Terraforming Post BSent:Mon, 05 Apr 1999 14:58:13 -0800Should I sent you the complete message I wrote up (and already posted ... finally ... on March 30th, 1999 Space Policy)? Let it first be said that the dominant force by far on a slowly rotating world will be the day to night energy imbalance, even more of an overall calorie or kinetic imbalance overall than an extremely great discrepency of pole and equator temperature, a good deal greater than the day to night ambient temperature difference, excepting the crucial cumulative effect [of weight and resultant force]. This is due to the 10:1 ratio or so of land surface area, more so in the case of the extreme poles where the polar vortex should be operating.

D. Semloh

**** Posted from RemarQ - http://www.remarq.com/ - Discussions Start Here (tm) ****

From: semloh@ficnet.net (semloh)
Subject: Re: Mercury Weather Patterns (was Terraforming Mercury)
Date: 1999/04/04
Message-ID: <n5LN2.5043$LX.1947875@WReNphoon3>
References: <7R%L2.464$dF4.1515588@WReNphoon1>
X-Originating-Host: 202.145.228.175

X-Trace: WReNphoon3 923237843 10.0.3.195 (Sun, 04 Apr 1999 07:57:23 PDT)
Organization: http://www.remarq.com: The World's Usenet/Discussions Start Here
NNTP-Posting-Date: Sun, 04 Apr 1999 07:57:23 PDT
Newsgroups: sci.space.policy

This ought to do it!?!

_ Weather Patterns on Mercury (was Terraformed Mercury) _

This thread is being reposted as so much time has passed as I was my country of residence and busy. To follow the entire proposal the thread "family" can be found at these locations (at least until the RemarQ folks have to change the format again):

<a href="http://www.remarq.com/threads.asp?group=sci%2Espace%2Epolicy&nav=p&threadNum=5000

9234 "> The beginning thread at Jan 14, 1999

Two threads on terraforming Mercury from Jan 26 and Jan 27

Two more Terraforming Mercury threads on Feb 1, 1999

Nicholas Landau <address> nlandau@eden.rutgers.edu</address> writes:

 Let me get this straight: with no coriolis effect, the winds will *not* blow from equator to pole? Are you sure that you don't have this backwards?

No, I didn't mean anything like that.

You are very correct about the coriolis effect on Earth breaking up our weather into what is quite close to a tricellular system (per hemisphere) that greatly segregates the higher latitude's weather to cooler temperatures.

But with much greater day/night imbalances of temperature gradients on very slowly rotating bodies, a quite different effect apparently would automatically deliver a similar result: very high speed winds occuping the

mid-section and the difference in wind direction being greatly hindered by friction as cooler air sinks and is ordinarily in much more direct contact. So any return winds would either have take a spiraling route to the equator, force its way through much more powerful winds (unlikely to much a degree), or take an elevated channel in convection (greatly limiting the amount of heat exachange with the lower air pressure and air volume).

The only observable model of this we have is on Venus where a rather similar wind pattern exists, by a process described in the book _Venus_ in chapter two _The Veils of Venus_ , pg 101:

"Because the equator-to-pole winds are much slower than those around the planet, winds on Venus blow mostly around the planet but also _slowly_ (emphasis mine) spiral towards the poles. The combination of these zonal and meridonal motions probably leads to the vortices in the polar regions."

Note that the authors are referring to the much more fluid upper course of the journey (free of ground friction and thicker atmosphere viscosity). Also, it is only the massive, ocean-like (1,000 year rotation for deep water) properties of the very thick Venus atmosphere that allows the temperature to be equalized well, very much so, in the upper latitudes, by way of local convection cells drawing from the latent bottom heat transferred via one of the stacked Hadley cells slowly operating.

For more information this link is useful , though it pays to remember that Venus has a gigantic atmosphere and has less insolation.

And IMO there should be the added effect of large scale water condensing out of the atmosphere at about the terraformed Mercury 55 degree latitude mark or higher, in my layman view adding yet another weather cell similar to the Ferrel cell on Earth but be far more uniform. I will speculate about the added barrier to weather mixing further by answering the question about the clouds and why the water might not collect at or near the equator:

Circulation would thus run from pole to equator. Actually, that is good news in terms of temperature balance, because that means that (relatively) cold air from the upper atmosphere would be sinking at the poles. However, its bad news for moisture balance because the moisture at the poles (where I assume 100% of the liquid water will be found) will be transported to the equator. It will not re-precipitate along the way.

Hmmm...actually, that depends

It depends on whether or not a) the circulation is strong enough to be a dominant effect or nearly so , b) the temperature would be cool enough, and the logistical c) the timescale is less than hundreds of years, which would not allow the installation of solar parasols. There are many reasons why none of these would be effectively true. The timescale (c), a deciding factor even if the other two conditions proved to be a hitch, is fairly

unlikely to be a problem as it took the Sahara desert a thousand years before its ice age lakes dried up due to the corresponding heat increase, etc. As far as whether or not the circulation would be strong enough I will be getting back to that in a few paragraphs. Now, about that heat.

Let's take the worst stand and the water collects on the equator. Where does it go when there? It can not remain on the surface (184 Celsius average just before terraforming, at present) nor can it stay anywhere near the surface unless as a gas (on Earth the temperature cools about 7 C per kilometer, which at 10km is still far above the .3 bar boiling point). Now where are those lowest upper cell convections taking place? Starting at 10 km and stretching to 30 km on Earth, Mercury's would start stop in the upper limits of its effective climate atmosphere (On .3 bar Mercury ~20 to 35 km?) because of the east/west preference and other factors, it is surmised. If you have a handy Encylopedia
Britannica, look up Hadley cell in the index or go to the _Climate and Weather_ Macropedia entry, figure 33, possibly page 467 if the edition is close to mine. It much more explanitory as an illustration, and especially note the ozone layer areas.

At the upper altitude water clouds should form, but the Hadley cell component equivilent on Earth, if there were a Ferrel cell equivilent on each Mercury hemisphere as I suspect (due to cloud and liquid water formation at the convergence zone), would remain near the low pressure (~.1 bar?) boiling point where the currents go to the convergence zone. The overall temperature of the planet absolutely must be segregated if habitability is possible, as the overall insolation is ten-fold greater, so the equalization of the temperature would not only be bad but a deathknell. It is fortunate, and at first counterintuitive, that this appears not to be the case, but it certainly not outside the somewhat winding history of discovery.

Further, there exists the posibility that humidity would collect in large area groups at the latitudes where updwellings form, pushing air to extreme heights and furthering the cycle with the (local) increased greenhouse effect via the H20 vapor. Eventually the feedback of the cycle would (could) form thunderhead type clouds even in weather areas where they would rarely develop well
, like near the downward dwelling areas which whose rh - relative humidity - is bone dry and make deserts) on Earth.

There clouds would form with droplets kept aloft at the top end (usually falling slowly if too large, which then evaporate and are thus kept in the system) until the mist sized drops are pushed to the upper air portions (almost certainly an inversion zone on the day side with high level convection from the equator), where it is absorbed. This is somewhat similar to the anvil head portion of a big thundercloud, reaching the lower stratosphere. If correct, the end effect would be yet another mechanism sharply limiting the rh of equatorial zones, as the spiral pattern to the equator would be continually punctured by water vapor being inserted to the second or third month longitudes into the "day" side, just before twilight which coincidentally is where the major Hadley cell activity from

the equator would take place. In this case, the cycle would take a short cut with much of the water.

Boiled down (no pun intended) it means that almost all water making it to the equator would be in the gaseous form. The exception being the most extreme atltitude limits, and perhaps not even there in places of updwelling, greatly increasing the updwelling process by letting sun hit the ground. (And it is important to also remember that on Earth liquid or gaseous water is a miniscule amount in comparison to that found on the surface.) While this is potentially a problem with the saturation level greatly increased with higher temperatures, 100% H20 above boiling point, in fact the water would not even then persist without covering the upperlevels with extremely dense clouds, denser still at the convergence zone. It is suggested that an equilibrium of some sort would take place.

Two equilibriums actually, one initial being after the introduction of the iceteroid ((_not_ the relatively tiny amount of cometary remnant ice as Mr. Landau apparently was under the impression, as that would only be important as a residual cold trap in the worst case settlement scenario as well as a partial effect in polar area local weather)). The other would be the more important long(er) term weather pattern(s) and would be pretty hard to be sure of with our present knowledge of weather, the basic air mechanics aside.

My equilibrium tricellular hemispherical model has two Hadley (meridional) cells -- one being the polar -- and a much more uniform, contigeous Ferrell cell belt, much like the Earth's but with the two upper latitudes cells being squeezed to the limit due to the heat and condensation factors. Many may dismiss this out of hand, but there are indications that this would come about mainly due to the presence of surface water above 65 degrees latitude, and the cooling effects of "night side-winter" rain cloud formation (very different from the Earth's subtropical convergence zones, but who said planets have the same weather with the similar effects?).

But if necessary the polar vortex alone might do enough of a jerryrigged job with extensive themal ice produced microclimates, and every significant researched planetary atmosphere I know of has one
(Uranus, when its axis directly points towards the sun, acts as you say though) -- to the contrary of the twice stated "intuition" --, the 'no coriolis' effect Venus as well. ((And Mars is observed to have a polar vortex that doesn't even seem allow dust to permeate, if that gives any relevant Mercury correlation as this excerpt shows:
"Aerosol signatures observed in high northern latitude limb spectra suggest that the vortex acts as an effective barrier, with dust transported from lower latitudes up to the vortex boundary but not into the interior. Scaling arguments are used to estimate dynamic time scales associated with the meridional transport."

aas.org/~abstract/dps98))

In short, it pays to be wary of immediate intuition in the complex world of

climatology, for all parties concerned, until it can be examined by involving as many of the enormous numbers of variables involved as is presently possible.

 Hmmm...actually, that depends. As the air rises at the equator, it will cool. For all I know, it will
condense enough to form clouds at high altitude. This would be good albedo medicine.

Maybe in the extreme altitudes where ozone is found on Earth clouds will form (pushed up by the enormous updwellings, well beyond that on the Earth's equator), but I do not know for sure, either.

My own personal view of the situation is covered fairly well in the above. And additional modeling is found on my last paragraph of this reply, with more information available upon specific request.

Well, in any case, the process by which high-altitude air is dried here on Earth (the precipitation of the moisture as the air rises in convergence zones) will not be present...if the water precipitates from the clouds, it will evaporate again as it falls to Mercury's searing equator.

The same goes for this above line.

Well, getting back to my original point, how in creation do you explain no cross-latitudinal winds in world without a Coriolis effect? You haven't explained this at all so far as I have read, only cited others. It sounds awfully wrong, and it is very important.

The whole notion that the circulation along longitutidal lines would be weak seems contrary to intuition and it is also very central to your assertions that Mercury would make a nice place to live.

The _notion_ is not wholly central. Not only is there the above to contend with, but also there would definitely persist microclimates via the lake waters in very high latitude craters (though there is some disagreement of ice in those same locations). In this case, the habitable regions should neither be extensive nor a new Santa Barbara, California, but still enough for a million inhabitants to settle in with fairly little trouble (details upon request, but this is mainly due to only a few tiny, reasonably comfortable locations, microclimes, are necessary for cities and the hardiness of marine life if the thermocline is extremely steep and shallow with an underlying 02/C02 rich, colder layer below as would be the case on Mercury's extreme poles' ice deposits, as is quite likely).

included the professor's assertion that, without the coriolis effect, the world would have only two circulation cells: the Northern Hemisphere and the Southern hemisphere.

I am quite sure this is wholly true for an astronomical body at the Earth's distance from our sun (or greater) if the rotational speed is faster than a week or so. Otherwise I would beg to differ with such an absolute statement ignoring other forces which are not able to be generated on present day Earth but do elsewhere massively.

The gas giants mentioned in the post have extremely powerful coriolis effects, and so have powerful circulation along lines of latitude.

And also are extremely large bodies. I am still drawn to parallels inferred with very fast wind east-west patterns continuously drawing up air material from below as might have some similarities involving updwelling at high speeds on the gas giants. You might also check
 Jupiter weather using the 'find' key word: _ hurricane _
to get a loose, conceived idea.

Well, getting back to my original point, how in creation do you explain no cross-latitudinal winds in world without a Coriolis effect? You haven't explained this at all so far as I have read, only cited others. It sounds awfully wrong, and it is very important.

Once again, I never, ever have taken the stand that _no_ cross-latitudinal winds would take place. That would be patently absurd. Muted ones are quite sufficient. Why, if only trace trans-latitudinal transfers developed then 90 degree latitudes would have a temperature of around 150 Kelvin, and freeze out C02 ice as well! As I said, absurd. But then you of course really mean large scale air transferrence from pole to equator which certainly would not happen quite as you suggest.

On any planet, the rate of transposed/transported air is off set by the natural heat loss by radiation into space, and the resultant temperature represents an equilibrium of these forces. I only suggest a muted equilibrium that would have profound alterations for the polar areas, enough to provide livable regions co-existing with insolation a decimal place above that on the Earth (actually, it varies but averages Watts/sq meter 9214 or 6.677 times that of the Earth). But as to what degree this would occur is not really clear at present by any detailed, rational account (which is also mostly why some inconsistancies pop up in in my writings from time to time).

David Semloh

From: semloh@ficnet.net (semloh)
Subject: New Group About My Planet M
Date: 1999/03/27
Message-ID: <sL8L2.1427$L6.148038@WReNphoon3>#1/1

X-Originating-Host: 202.145.228.193
X-Trace: WReNphoon3 922556504 10.0.3.195 (Sat, 27 Mar 1999 09:41:44 PST)
Organization: http://www.remarq.com: The World's Usenet/Discussions Start Here
NNTP-Posting-Date: Sat, 27 Mar 1999 09:41:44 PST
Newsgroups: alt.planets.mercury

Mercury is such a fascinating world. It used to be called boring. A moon-like world. A place not worth going to. A place having little to teach. Hard to get to. Useless. Unloved ...

Well, yes and no. I could yammer on about the Earth like core, but that would sound too much like a scripted cliche excerpt from a watered down TV science program.

Actually, the Earth like core does allow it almost 40% of the Earth's gravity, which could be valuable.

And for other reasons the world is quite possibly the easiest to be the first terraformed planet with a breathable atmosphere. (But that is quite a difficult order, so that is my reasoning and stipulation boilerplate of the statement.)

And millions of people would love it, call it home, cherish the huge disk of the sun, and gradually settle the planet with a hundred million people (greatly modified by then). Someday, I predict, this will come true.

I like this big chip of rock so much so that lots of links will soon be posted about it for any interested person in this new group. Here is one of my favorites, though be warned that it is a bit technical::

Mercury Messenger Publication of The Mercury Messenger, a newsletter concerned with exploration of the planet Mercury, began in December 1987. The issues are posted in PDF format, viewable with the Adobe Acrobat Reader (click here to download the reader).
92% 6/11/98 Mercury<http://192.101.147.17/publications/newsletters/mercmessenger/>

Until I have the time to post more layman type links,

David Semloh,
someone who is _not_ joking here

Тераформирането е глупаво да се разглежда просто като осигуряване на нови земи, кадето да се разселва "закъсало човечество". Стойността на колониите -- на планети, луни и в "голия космос" -- се състои изцяло в това да са места за нов растеж, на нови общности и клонове на цивилизация, а не празни квартири в които да се настанява население от евентуално пренаселена земя. В този смисъл Меркурий може да се тераформира, не защото ще осигури някой и друг милион квадратни километра човекоподдържаща екосистема, за разреждане на земното "пренаселване", а защото има силни податки, ако сметките на Семлох излизат наистина, че това, колкото и контра-интуитивно да звучи, е най-лесната, евтина и бърза планета за тераформиране. Нужен е сам един 100-тина километров водно-амонячен купертоид и 100-150 години за да се формират земеподобни микроклимати в полярните зони на планетата. Естествено, е че такъв тераформинг без парасол (сенник) в L1 не може да бъде пълен и средата ще бъде субоптимална, както в най-горещите земни зони, но и това е нещо...

Колкото до радиацията: юпитеровите галилеевци орбитират в най-свирепите радиационни пояси в системата, а на Марс е на 1 / 2 като в открития космос... Същите но с по-малък мащаб (и цена) противорадиационн мерки могат да се приложат и на Меркурий. Два-три пъти по-дебелия въздушен слой ще свърши работа.

Примерът с екзотиката Меркурий в тераформирането, беше само да се покаже, че тераформирането (като общо понятие за строителство на земеподобна екология извън земята) е възможно в много по-голям пространствен диапазон отколкото се мисли обикновено -- от наврени в самото слънце хабитати до такива греещи се на светлина събрана буквално от звездите в междузвездното пространство или от лъчите на мощни солазери. Въпрос на управление (редуциране или концентрация или конверсия) на енергийни потоци...

За метана от юпитеровите луни използван като химическо гориво, няма да коментирам. 😟😟😟

Ще ви пусна, наистина едно резюме от техники за колонизиране на всички тела от системата от малки-към големи... Накратко само, като гледам коментарите цитатите за Меркурий бяха май много длъжки.

Есенцията на космическото колонизиране се състои изцяло и само в това -- създаване на земеподобна човекоподдържаща екология извън земята. Всяка такава изкуствена среда следва да притежава основни характеристики и параметри -- гравитация, температура, дихателен състав, налягане... -- в които да се вмества физиологическата поносимост на непроменени (и необременяващо подсилени от екипировка) човешки същества. С изискването за немодифицирани човеци допускаме, че поне част от човечеството ще продължи консервативно биологичната си традиция и старата си стратегия за пространствено разселване и растеж на популацията..., т.е. приемаме, чее човекът си остава такъв какъвто си е. В общи линии границите на поносимост на човешкия организъм са известни. Въпросът е изкуствените среди да притежават тези величини в стойности позволяващи дълготрайно пребиваване (заселване) по целия жизнен цикъл на човешката фауна -- вкл. размножаване и отглеждане на потомството.

При тези ограничения имаме две решения: частично или пълно преобразуване по човешка мярка на съществуващи среди или изграждането на такива от нулата. Тъй като условие за еко-строителство е гравитацията (предпочитително около 1 Же) то две са стратегиите -- използване на естествени гравитационни кладенци и въртене заради псевдогравитационния ефект на центробежната сила. По-долу -- сратегиите -- с уговорката, че описаните варианти

изцяло лежат в обсега на съществуващите или доказани материали и технологии...

Първата стратегия се отнася до тераформирането на естествени тела: планети, луни, даже звезди. Изискването е тялото да има достатъчно висока гравитация за да задържи атмосфера за поне няколко хиляди години. Освен гравитацията може да се използват разннобразни други методи за предодвратяване дисипациата на атмосферите: изкуствени магнитосфери, които да завръщат избягващите атоми и молекули, световни "палатки" и "геодезични куполи"... и т.н. при по-малките тела. Местоположението на телата спрямо звездата не е от значение, както посочих, предвид възможностите за производство, пренасочване и отклоняване на естествена светлина към и от съответната изкуствена екология. Така, във възможностите за тераформиране лежи и преобразуването както на Меркурий, така и на свръхдалечни планети -- Плутон и далеч отвъд него. В Слънчевата система имаме голямо меню от светове, но извън нея може да ни се наложи да заселваме/преобразуваме, даже по-екзотични среди -- в зависимост от предлагането... Обектите с по-голяма гравитация + липса на твърда повърхност (газови гиганти, кафяви джуджета, звезди, бели джуджета, неутронни звезди, черни дупки) могат да се колонизират директно като се изграждат свръхсветови черупки около тях. Върху черупките се възпроизвежда земеподобна среда. Осветяват се отвън или отвътре -- с безбройните методи за производство, преобразуване и/или пренасочване на светлина.

По Втория начин -- центробежния можем да изграждаме също толкова голямо разнообразие от "светове", ако липсват естествени източници на гравитация при звездата-цел : издълбаване или балоноформиране на съществуващи астероиди (включително и използване на пакетиран воден лед като строителеен материал във външните части на системите); дизайните от каноническата Станфордска конференция през 70-те: тор, цилиндър или сфера като форма. Размера на въртящите се колонии завси изцяло от здравината на използваните материали: до няколко десетки километра диаметър при металите и техните сплави, няколко стотин при синтетичен кварц, сапфир и други кристали, както и при органичните полимери като кевлар, спектра и др., няколко хиляди при използването на диамантоиди и фулерени (до 5000 км. диаметър се коментират за колониален дизайн с въглеродни нанонишки). Тъй като торът и сферата са компромиси или преходни начални етапи в строителството на цилиндър, и при "вроденото" ограничение само по диаметър, може да удължаваме цилиндъра до безкрай. След определена дължина може да го усукваме, без това да пречи на структурната цялост и на въртенето, като по този начин увием слънцето с т.нар. "спагети-мегаструктура" или "топополис" с обща дължина от хиляди светлинни години при макс.диаметър. Ограничение тук е енергийния бюджет на централната звезда. Материалите са налични в системата без да се налага да извличаме от самото Слънце, което се явява най-големия резервоар на каквито и да било елементи от таблицата.
Като цяло въртщите се дизайни са милиони пъти по ефективни като масоемкост...