

500.000

ALTITUDE

0 -> 500.000

384.786 KM MOON
orbital period: 27.3 days [655.2h] . orbital speed: 3600 km/h

50.000

35.786KM ↑ HIGH EARTH ORBIT

35.786 KM [ORBIT DIRECTLY ABOVE THE EARTH'S EQUATOR] GEOSYNCHRONOS SATELITES
orbital period: 23 h 56min . orbital speed: 11,160 km/h
communication and weather

25.000

20.350 KM [BLOCK SATELLITES, MIN 24] GPS SATELLITES
orbital period: 12h . orbital speed: 14,000 km/h

12.742 KM [DIAMETER] EARTH
one more earth onit top would fit

10.000 KM, EXOPAUSE 0 -> 2.000c
molecule concentrations are extremely small - collision negligible, almost vacuum, protect the earth from meteors, asteroids, and cosmic rays
[molecules from the atmosphere can overcome the pull of gravity and escape into outer space]

H 99%

2.500 KM ↑ Solar ultraviolet radiation dissociates molecules of water vapour-> CH4 H
[same on Venus, Mars, Jupiter, Saturn, Uranus, Neptune]

HH+

2.000KM ↑ MEDIUM EARTH ORBIT

HE HE+

700 KM ↓ THERMOPAUSE 500c -> 2.000c+
few molecules, each has a huge amount of kinetic energy, upper part atomic components, lower part molecules
Much of the X-ray and UV radiation from the Sun is absorbed

O N HE

500

600 - 800 KM [ORBIT AT THE SAME ANGLE IN RESPECT TO THE SUN] SUN SYNCHRONOS SATELITES
orbital period: 1h 36min - 3h 26min . orbital speed: 27,359 km/h [orbits like a scanner from pole to pole]
capturing images of the earth in contant light and the and sun

547KM [1990 04 24] HUBBLE TELESCOPE
orbital period: 1h 36min . orbital speed: 27,359 km/h

450

400

350

300

250

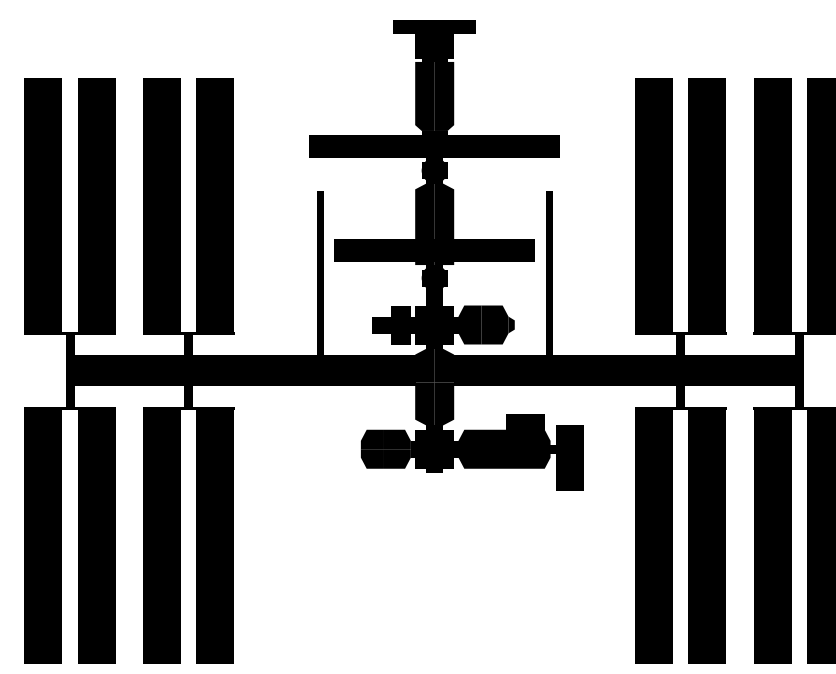
200

150

80% 20%

N2 O2

160KM ↑ LOW EARTH ORBIT



340KM [1998 11 20] INTERNATIONAL SPACE STATION
orbital period: 1h 32min . orbital speed: 27,600 km/h

[Heterosphere] ↑ components tend to separate out [gases stratify by molecular weight] . atomic H and protons [H+] are dominant
100 KM -> **KÁRMÁN LINE** defined as edge of space
[Homosphere] ↓ atmospheric gases are well mixed

80 KM ↓ MESOPAUSE -100c 0.01MBAR
coldest part of the atmosphere . few molecules . Most meteors vaporize here

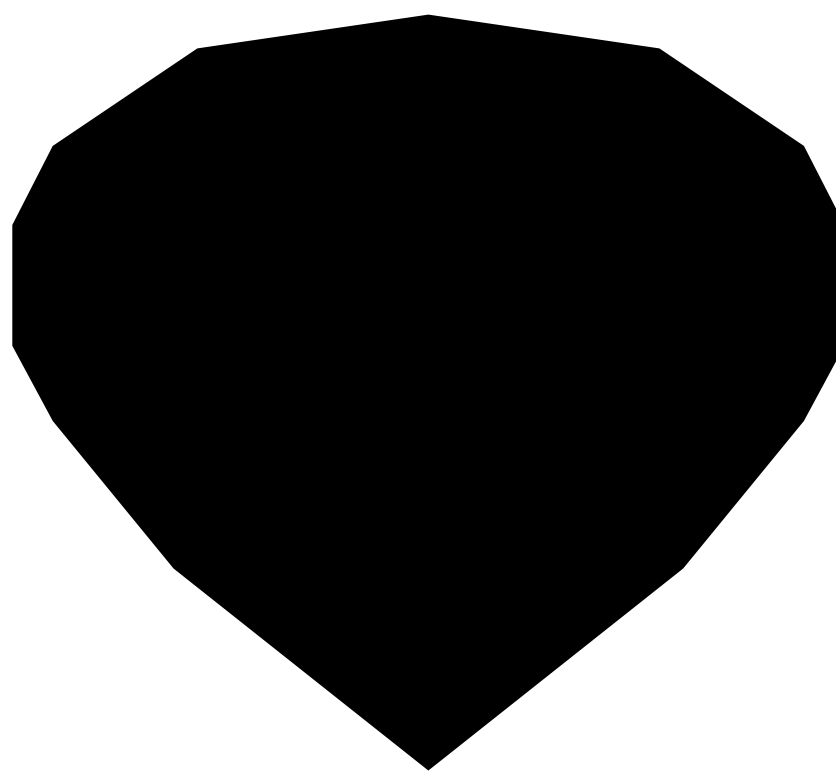
60KM ↑ IONOSPHERE [60->1000km] electrically conducting region [ultraviolet radiation creates ions and electrons from atoms and molecules of the air] -> radio propagation
[negative electrons and positive ions are attracted by the electrostatic force, but they are too energetic to stay fixed together]

50 KM ↓ STRATOPAUSE 0c 10MBAR
incoming solar ultraviolet radiation [UVB and UVC] is absorbed by the ozone layer : O3 [ozone] -> O O2 [heat is released]
[maxi.concentrations of ozone @ 25 km . increase of temperature with altitude]
Temperatures rise with altitude -> little convection and mixing -> very stable -> it inhibits rising air

50

40

42KM [2014 10 24 . ALAN EUSTACE] STRATOSPHERE JUMP
2h 7min . descent : 15 min [free fall: 4 min 27 sek] . peak speeds: 1,322 km/h



18 - 37KM [FILLED WITH HELIUM OR HYDROGEN] HIGH-ALTITUDE BALLOON
[stratos balloon [height: 102m] . BU60-1 [japan 2002 03 23 . attained 53km . volume: 60,000m3 . 260m/min]

24 KM -> [POLAR NIGHT JET STREAM] [only winter . latitude 60°N]

25 900KM [1964 - 1999] BLACKBIRD SR-71
Mach 3.3 = 3,540 km/h . range: 5,4km . climbing: 60 m/s . length: 32.7m . crew: 3

9 - 18.3KM [1969 - 2003] CONCORDE
Mach 2.02 = 2140 km/h [landing: 274 km/h] . range: 7,222km . length: 62m . runway: 3,800 m . passengers: 92-120/128 [+3]

16 KM -> JET STREAM, SUBTROPICAL [10->16km] [latitude 30°=close to equator]
[equator gets more solar energy -> hot air spreads towards poles]
atom info: H_1P+ HE_2P+ C_5P+ N_7P+ [largely inert] O_8P+ [extremely reactive] NE_10P+ AR_18P+ [inert noble gas]

14 KM ↓ TROPOPAUSE -55c 100MBAR [9KM@poles . 17KM@equator] molecules are well mixed
[weather takes place . 99% of all WATER VAPOR . 80% of the mass of earth atmosphere]

15 460KM [2006 08 29 . STEVE FOSSETT + EINAR ENEVOLDSON] GLIDER
Glaser-Dirks DG-500 . 4h climb . wingspan 22m . El Calafate, Argentina [used polar night jet + /jet stream]

12.5 - 15 KM BUSINESS JET
lear jet 45 . speed: 858km/h . range: 3,167km . length: 45m . runway: 975m . passengers: 9 [+2]

12 KM ↓ CLOUDS HIGH [cirrus, cumulonimbus, cirrocumulus, cirrostratus]

11 KM -> JET STREAM, POLAR [7->11km] [latitude 60°=close to northpole]
all jet streams: propagate east < 5km thick . 92 - 215 km/h
[equator gets more solar energy -> hot air spreads towards poles, jet stream becomes wavy if amplified through warm influence]

7 KM ↓ CLOUDS MIDDLE
[RAIN, cumulonimbus, alto cumulus, altostratus, nimbostratus]

2 KM ↓ CLOUDS LOW
[RAIN, cumulus, stratus, stratocumulus, nimbostratus]

0 KM -> EARTH [surface] **+15c 1.000MBAR**

-0.2KM CONTINENT SHELF

-3.7KM AVERAGE OCEAN DEPTH

-6KM ABYSSAL PLANE [-6 -> -4km]
covers > 50% of Earth's surface

-10.994 KM MARINA TRENCH **+1c 1.086.000MBAR**
[density of water -> +5%]

-10.898 KM [2012 03 26 . DSV DEEPSEA CHALLENGER, JAMES CAMERON] descent: 2.36h
-11.935 KM [2009 09 . OIL RIG] -10,685 km in 1,259 m depth gulf of Mexico . Tiber Oil Field
-12.262 KM [1984 09 27 . VILGISKODDEOAYVINYARVI] KOLA SUPERDEEP BOREHOLE

8.848 KM SAGARMĀTHĀ
[Forehead in the Sky], Mount Everest, camp I: 5,577m . camp VI: 5,577m
6,961KM ACONCAGUA
highest mountain in the Andes . overste height: 4000m
6KM RUEPPELL'S VULTURE
seen@altitude: 11,300m . wingspan: 2.6m
3.5 - 4.5 KM SKYDIVE
from 5,000m with oxygen
3KM HOT AIR BALLOON
height: 23m [2005 11 record: 21,027 m]
0.828 KM BURJ KHALIFA
-0.5 KM length: 30m
BLUE WHALE
-2.25 KM length: 16m . breathes 6min/dive
SPERM WHALE
-3.784 KM [1911 03 - 1912 04 . HITAN ICEBERG AND SUNK] length: 300m
TITANIC
CHALLENGER DEEP
DEEPWATER HORIZON

0

-10