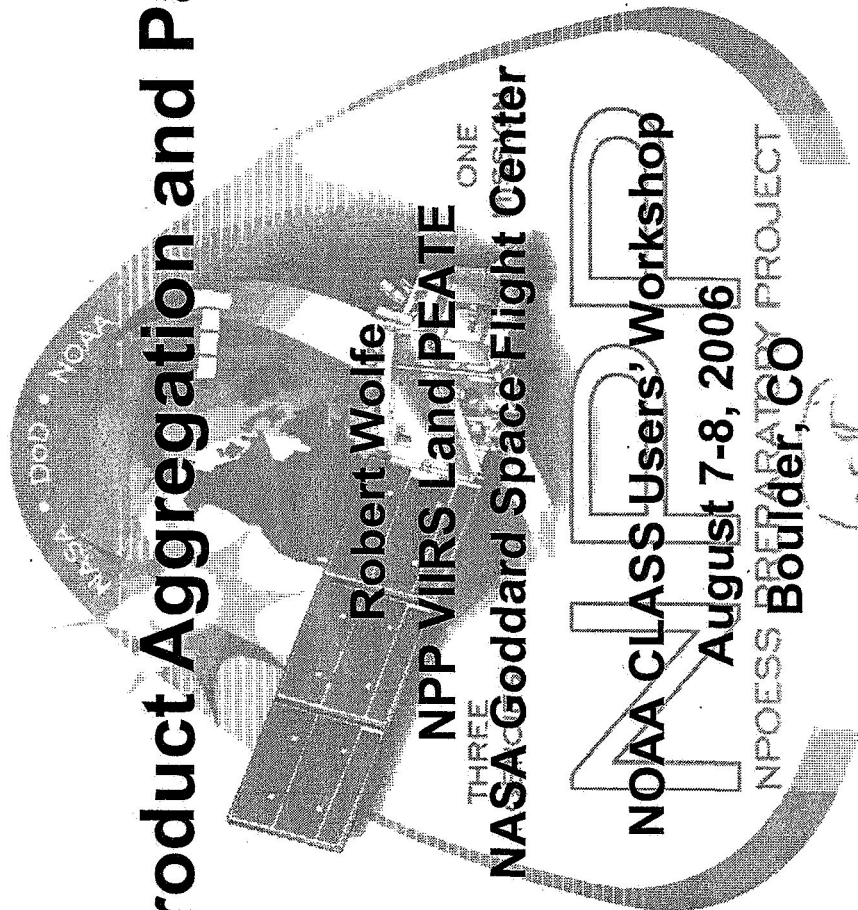


# VIIRS Product Aggregation and Packaging



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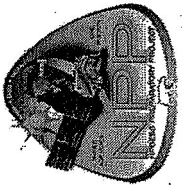
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*Wolfe*

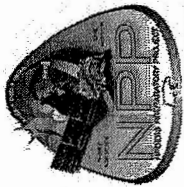
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# Background



- There are three broad areas where the end-users can help define the VIIRS products distributed from by NOAA:
  - Temporal aggregation
  - Band packaging
  - Geolocation packaging
- Good decisions in these areas will make the products more useful to the community
- NASA NPP VIIRS scientist and engineers would like to develop a community consensus in these areas to help make our job easier
  - it will make evaluation of the xDRs easier for us
- Note that other product specific format concerns (scaling, QA bits) are important but not part of this presentation
- Our proposals in these areas are based on our experience from NASA EOS missions and programs (e.g, MODIS, SeaWiFS) which are used by a broad operational and scientific community
  - MODIS science team and associates alone are close to 200 users



## VIIRS Temporal Aggregation – Background



- IDPS's basic unit of production for a VIIRS swath xDR is a 28 sec. granule – this size is driven by processing efficiencies, not by end-user needs or for ease of archiving
- NESDIS, in their instance of the IDPS, can choose how the 28 sec. granules are temporally aggregated
- Temporal aggregation can reduce the number of VIIRS swath xDRs granules that need to be handled by a factor of 10 or more
- Aggregation options considered:
  - 5 minute granules (MODIS heritage)
  - 1 orbit granules (AVHRR heritage)
  - 12.5 to 16.7 minute granules (1/8 to 1/6 orbit) (unknown heritage)

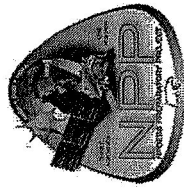


# VIIRS Temporal Aggregation – Our Proposal



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- We are proposing that the VIIRS xDRs be aggregated in 5 minute granules
- Rational: many users are happy with MODIS 5 minute granules
  - Granule size was chosen to keep the multiple band L1 (SDR) EDR granules to a reasonable size (< 500 MB) while minimizing the number of granules
- Proposal advantages:
  - Users needing to inter-compare or VIIRS data with MODIS 5 minute granules will benefit from a 5 minute granule
  - For operational users, five minutes is a good compromise for size vs. latency
  - Granules are more easily visualized because they are roughly square
  - Works well with band and geolocation packaging (below)
- Disadvantage of even larger aggregates:
  - Even larger aggregates would further reduce the number of granules – but this comes at the cost of increased latency and granule size

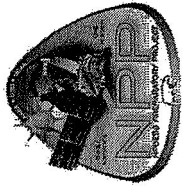


## VIIRS SDR Band Packaging – Background



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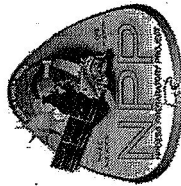
- IDPS's basic unit of production for a VIIRS SDRs (calibrated radiances) are granules containing individual bands – this was also driven by processing efficiencies, not by end-user needs or for ease of archiving
- NESDIS, in their instance of the IDPS, can choose how the SDR bands are packaged in a product
- Band packaging can reduce the number of VIIRS SDR granules that need to be handled by a factor of 10 or more
- Band packaging options considered:
  - Individual bands – no band packaging (unknown heritage)
  - Resolution, e.g. all M bands together (MODIS heritage)
  - Spectral, e.g., all thermal bands together (ASTER heritage)
  - By end use, e.g., all “Ocean color bands together” (Ocean Color subset heritage)



## VIIRS SDR Band Packaging – Proposal



- We are proposing that the VIIRS SDRs be aggregated by resolution in three files: I bands, M bands and D/N band
- Rational: many users are happy with MODIS granules that are packaged by band
- Advantages:
  - Users needing to use or inter-compare VIIRS granules with MODIS granules will benefit from having all bands with the same resolution in one product
  - For operational users will benefit from a reduction in the number of granules needed to be handled and tracked
- Disadvantages:
  - Some users will get some bands that they don't necessarily need – this could be mitigated by NESDIS/CLASS providing a band subsetting capability

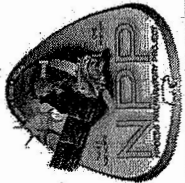


# VIIRS Geolocation Packaging – Background

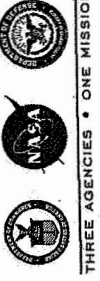


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- IDPS's produces 6 different VIIRS geolocation products, two geolocation data sets for each resolution (M, I and D/N)
  - Both the intersection with the Ellipsoid and with the Terrain are produced
  - In addition to the spatial coordinates (lat, long, and terrain height) the viewing geometry is also produced: solar and sensor azimuth and zenith angles, range, and for the D/N bands, lunar azimuth and zenith angles
- NESDIS, in their instance of the IDPS, can choose how the geolocation data is packaged in the SDR and EDR products
  - Geolocation can also be requested as standalone products
- Proper geolocation packaging can make the products more useable
  - However, packaging geolocation in every product can make the overall storage volume very large
- IDPS does not have a sub-sampled geolocation packaging option in the – i.e., provide the geolocation (or just the viewing geometry) for every  $n^{\text{th}}$  line/sample
  - This is one option that is currently being used in MODIS L1B and L2 atmosphere products



# VIIRS Geolocation Packaging – Proposal



- We are proposing that:
  1. Terrain corrected VIIRS geolocation be packaged with SDR data packaged by band resolution (see above)
  2. In addition, store terrain corrected geolocation data separately for each resolution – so that users can order it with any EDR product
  3. Do not store the ellipsoid geolocation for any resolution
- Advantages:
  - We are not aware of any users of the ellipsoid geolocation
  - Altogether, the volume stored in the archive is equivalent to the volume produced
- Disadvantages:
  - EDR users will either have to also order the SDR products or separate geolocation products



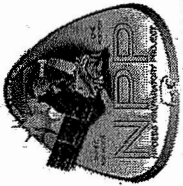


## VIIRS SDR Band Packaging – Wish List



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- An additional option (on our wish list) would be to spatially aggregating the I bands and D/N bands to the M band resolution (similarly for the D/N band to the I bands)
  - virtual M (and I) bands are created
  - this would involve a resampling step for the D/N bands since they are not nested within the M or I bands
  - MODIS also creates virtual bands by spatially aggregates the finer resolution 250m and 500m bands
  - Some I bands may not need to be aggregated because they are spectrally the same (I1 and I2) or similar (I3 and I4) to the M bands
- Advantages:
  - this allows users without a need for the higher spatial resolution to easily use the VIIRS I bands and the D/N band
  - it would also allow the D/N band to be more easily used with the I bands because it would have the same geometry
- Note that this option is not something the current IDPS system has the capability to produce (so augmentation would be needed)



# VIIRS SDR Geolocation Packaging – Wish List



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- An additional option (on our wish list) would be have sub-sampled geolocation packaged with some EDRs
  - Package geolocation (or just the viewing geometry) for every  $n^{\text{th}}$  line/sample
- Advantages:
  - this would allow users (e.g. of atmosphere products) who do not need the full resolution geolocation to get EDRs packaged with just the geolocation they need